Mapping Mashups: Participation, Collaboration and Critique on the World Wide Web

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Abstract

"Mashups" are web-based maps that intermix user-created data with information gathered from multiple online sources. As part of the wave of "Web 2.0" technologies, mashups represent a shift toward distributed authoring and sharing of Internet content, complicating traditional modes of knowledge production. Mashups originated in the open source "hacker" movement and are now associated with the term "neogeography," used to describe the practice of amateur mapmaking online.

In this thesis I ask whether mashups facilitate a cartography that is more accessible and democratic, studying the ways in which mashup authors create alternative community or personal cartographies while remaining dependent on existing power structures for data and resources. I illuminate these issues through a series of examples, such as: mashups that render personal memories about places, maps created by activist groups to counter dominant representations of geography by governments or corporations, and websites that facilitate the collaborative creation and sharing of spatial knowledge within community groups.

Contrasting these case studies with traditional paper cartography and GIS, as well as the professional online mapping technologies of the Geospatial Web (or GeoWeb), I explore how mashups attempt to represent personal, subjective, overlapping and contradictory perceptions of space and place. While enthusiastic claims about the ability of mashups to wrest mapmaking from state and corporate hands are currently overstated, I conclude that mashups do in fact provide new ways of collaboratively representing space whose implications are still to be determined.

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Chapter 1: Introduction

For centuries maps have staked out territory, marking out competing claims on space, while the discipline of cartography has often been a contested battleground of social currents and technological change. In the 20th century, maps expanded from their traditional role as repositories of precious territorial knowledge—mobilized for governance, navigation, resource extraction, and warfare—into mundane consumer articles, appearing in billions of printed copies from road atlases to newspaper weather maps (Wood 2006). In recent decades, computers have revolutionized the ways maps are produced, and early web sites for online mapping furthered the infusion of maps into daily life, promising that the world's information would soon available on demand through geographical searches.

Yet, throughout all these drastic changes in access and availability of maps and geographic information, the user remained a passive consumer. Only with recent developments on the internet has this begun to change in a meaningful way. The map (and its means of production) has begin to fragment, as new technologies allow users to customize online maps, remix map data and mapping services, and submit their own geographic information. It is these user-created online cartographies, called *web map mashups*, that are the focus of this thesis.

Mashups developed in the wider context of Web 2.0, itself an umbrella term for a number of distinct but related trends occurring at the start of the 21st century. Popularized by technology writer Tim O'Reilly, Web 2.0 is a paradigm of user participation driven by modular and customizable online services (O'Reilly 2005). Web 2.0 includes social networking sites (such as Friendster, MySpace, and Facebook), and user-generated content (YouTube, blogs, Wikipedia), in contrast to the Web 1.0 of monolithic sites providing information to an audience of passive observers (exemplified by web portals such as Yahoo and e-commerce sites like Amazon.com). Some have characterized the shift to Web 2.0 as one from a "read-only web" to a "read-write web". Countless mainstream books have been written about the phenomenon, including *Wikinomics* (Tapscott and Williams 2008), *The Wisdom of Crowds* (Surowiecki 2005), *Here Comes Everybody* (Shirky 2008), as well as more contrarian analyses such as *The Cult of the Amateur* (Keen 2008).

Whether or not average users have heard of Web 2.0 or think in those terms, they are likely to encounter user-created content on the web. However, not everyone participates fully, as

illustrated by internet theorist Geert Lovink's 1% rule: 1% of the people on the web actually author content, 10% edit or comment on it, while 89% passively consume that content (Lovink 2007: xxv). Thus, despite its rhetoric of democratization (Beer and Burrows 2007), Web 2.0 remains an incomplete and problematic project, shaped by uneven control of information and resources, contingent development of technology, and disrupted social expectations relating to questions of free expression, privacy, and ownership of information.

The purpose of this thesis is to explore some of the implications of Web 2.0 technologies and practices on geospatial information and geographical thought, using the mashup as a point of departure. This research is the story of two socio-technical revolutions: the amateurization of mapping and the remix-ability of the map itself. While these developments depend on computers for storage and processing of data, it is the development of the computer/communications *network* that undermines hierarchical authority in mapping, producing a flattening effect and fostering interconnection between parts. The phenomenon of the mashup most succinctly illustrates the shifts that are occurring as geospatial information transitions not only into an automated, *computerized* representation (as has already occurred with the development of Geographic Information Systems) but into a fully *networked* form.

Outline

In chapter two I begin by exploring the history of the term mashup in cultural practice. In the field of music in particular, mashups are an underground form of artistic expression that combines parts of existing compositions into a new work, usually in violation of copyright laws. Music mashups reached a fever pitch in the years immediately preceding the development of web mashups and provoked a number of social and legal questions regarding the copying and remixing of digital data, questions that framed much of the debate surrounding mashups online. I then give examples of the first well-known *mapping* mashups, HousingMaps and Chicago Crime, detailing the technological landscape in which they were created. I catalogue the ways in which the term "mashup" has been understood and used by various parties, depending on their position relative to the technology, their degree of vested interest in preexisting data sources and software, and the audiences they were writing for. I also attempt to define some terms that are clearly related to the mashup phenomenon, such as the "Geoweb".

Chapter two ends with an exploration of the ideas of open source and the Creative Commons, and how they are linked to mashups. I argue that a focus on the origins of the term *mashup* in music (and a narrow reading of the term among mapping mashups) draws attention to the need for open source licenses for data and creative output in order to foster continued innovation and social engagement in geographic information. I end with a discussion of OpenStreetMap, which, while not strictly a mashup, represents a Web 2.0 mapping project made necessary by restrictions on the mashability and reuse of existing datasets.

In chapter three I attempt to position mapping mashups with respect to the existing geospatial technology of Geographic Information Systems (GIS). I address how GIS professionals and academic geographers have received the introduction of more user-friendly tools and user-created information, particularly rise of the term "neogeography" by amateur map makers and the analogous concept of "Volunteered Geographic Information" as articulated in the academic literature. I also focus on how mashups fit into the trajectory of critiques of GIS. In particular, I look at Renee Sieber's (2004) proposal for a re-engineered vision of GIS—one that is more sympathetic to disadvantaged groups and a wider diversity of representations—and Christopher Miller's (2006) argument that mashups have in fact fulfilled most of the requests of the critics of GIS. I argue that mashups stretch the potential of GIS in ways beyond what Miller identifies, but also succumb to many of the perceived flaws of GIS. Ultimately, I suggest that it is hardly an either/or proposition between GIS and mashups, and that the two technologies may present opportunities for synergy rather than competition.

In chapter four I explore the idea of mashups as an "outsider" practice—following the similar connotations of the term in music—and examines how mashups can operate as a kind of "counter-mapping" that uses map making to contest established representations of space and structures of power. I also call into question this outsider interpretation of mashups, pointing out the ways in which they are complicit in dominant interpretations of space, and the ways in which powerful corporations have attempted to co-opt the outsider aesthetic of mashups. I also detail how the search engine companies have in fact encouraged mashups, trying to bring them further onto their own servers, resulting in vendor lock-in and lock-down of a community of users into a stream of advertising revenue.

In chapter five I lay out the possibilities and consequences of mapping the personal via mashups. These mappings of personal data can occur actively, by users placing pushpins and

submitting data, and passively, through the automated geocoding of daily online activity such as blogging and the sharing of Flickr photos. Chapter five goes on to explore the possible implications on personal privacy, and also ways in which mashups could be interpreted as a means of individuals taking ownership and control of their own digital geographic representations. I end the chapter with an analysis of the ways in which mashups may embody many theoretical interpretations of the creative, exploratory power of mapping, in contrast to the more concrete and closed practice of map-making. I conclude by asking how mashups, as a technology born of network structures, may point the way toward a cartography of and by the emerging network society.

Theoretical Context

Mashups have been under-theorized, especially within the discipline of geography. Some of the concepts of Web 2.0 are being addressed at the level of the Geoweb, as geospatial professionals in academia, business, or government investigate how to use distributed technologies to share, store and process data on the web. The user-centered technologies of Web 2.0 are also drawing some interest as a means for geographers to disseminate information to the public (publishing results, soliciting feedback or active participation in mapping, developing enhanced Public Participation GIS, and so on). Even the geographical activities of amateurs that have nothing to do with professional geographers—hobbyist geotagging and user-generated mapping, for example—have garnered attention as potential data sources for analysis by professional geographers under the term "citizen sensors" (Goodchild 2007a). But little academic attention as been paid to the mapping made by amateurs *for* amateurs that does not (perhaps yet) produce data that geographers would be interested in. The primary example of this kind of activity is the web map mashup.

This research attempts to help fill this hole in geographic scholarship. Drawing upon analysis of a variety of mapping mashups, as well as surrounding online texts (primarily blog posts and technical articles), I attempt to place the phenomenon of mashups in a variety of theoretical contexts: 1) the discourse of Web 2.0 and internet culture, 2) critiques of the pre-existing, professionalized geospatial technology of GIS, and 3) practices of counter-mapping and hacktivism. Ultimately, I argue that mapping mashups can be seen as an embodiment of the network (as

a communications technology and as an organizational form) applied to the field of geospatial information. This interpretation should not be considered an endpoint of the analysis, but rather a starting place from which it is possible to begin asking questions about the implications of this socio-technological practice both within the discipline of geography and in the daily life of the average digital citizen.

This research attempts to avoid technological determinism, that is, a belief that the development of mashups is inherently emancipatory, or even that it is a technological "advancement," as some geospatial professionals might consider mashups to be a less-advanced, inferior version of GIS that uses data which is imprecise or inaccurate. Instead, I intend to look at the ways in which mashups are used, and they ways in which their use affects individual and community expression and understandings of space. In this sense, while the technology itself is not inherently good or bad, I take an unambiguous stance in favor of *uses* and *practices* that encourage expression, communication and the empowerment of individuals and communities.

Tempering any hope that mashups could enable the public to be more critically engaged with geography, or more connected with their community, is the fact that mashups still boil down to individuals sitting alone in front of computer screens. As Lovink writes, "We should be wary of techno-contradictions like social software that suggest technology will glue us humans together (again)" (2007: 231). All the analyses in this paper should be read with a sense of perspective and the recognition that mashups are nothing more than computer programs that can only facilitate, not produce, social relationships.

Questions to be Asked

In this paper I hope to contribute some preliminary thoughts to a field of research that is still in its very early stages. Many of the definitions used are still poorly defined or in flux, and at the same time these technological and social currents are constantly shifting, dividing, and recombining. With the emergence and surge of mashups online, a number of questions arise regarding how they function as a new kind of cartography. For instance, how do mashups compare to earlier forms of geographic representation such as paper and GIS maps, which are largely produced by singular "authors," essentially governments and corporations that sponsor and authorize them? What do mashups tell us about individual perceptions of geography? Can mashups

reflect the multitude of experiences of all the people inhabiting a space? Do mashups comprise a democratic mapping practice that opens up representations of space to concerns beyond those of business and the state? Can mashup sites flourish under the administration of a community, or are they always lead and dominated by a single author figure? Given that mashups depend upon the technology and data of web mapping sites, to what extent can they offer a mapmaking that is autonomous of corporate and government control?

It is my belief that mashups in fact provide new tools and new ways of representing space and as such define a new cartography, whose implications are still to be determined. Nonetheless, it is clear that enthusiastic claims about the ability of mashups to wrest mapmaking from state and corporate hands are currently overstated. Ultimately mashups are neither inherently liberating nor repressive, but rather are instruments used toward different ends, embedded in a network of interdependencies and interests.

Chapter 2: Mashups, Remixing and the Geoweb

The Origins of Mashups

"Defiant Downloads Rise From Underground" headlined an article in the New York Times on February 25, 2004, describing how hundreds of websites and blogs had united in "a day of coordinated civil disobedience." Under protest was record label EMI's crackdown on the free and online distribution of The Grey Album that had become a flashpoint for debates on copyright and authorship. The work catalyzed controversy because its artist, a DJ named Brian Burton who goes by the stage name Danger Mouse, had combined vocals from rapper Jay-Z's Black Album with instrumentation from the Beatles' White Album. Although the work was never intended for commercial release, its circulation online was so widespread that it came to the attention of EMI, owner of the rights to the Beatles' album. Seeing the album as a case of copyright infringement, EMI took legal action against the artist and its major distribution outlets on the web. For the protesting groups, EMI's copyright claims were irrelevant because they considered the album to be, in fact, a new work known as a *mashup*, creatively reassembled from elements of pre-existing works. However, the debate around copyright and authorship in this case was not strictly two sided because Jay-Z's label, Roc-A-Fella, released an *a cappella* version of the album's vocal tracks to DJs for the express purpose of remixing, complicating the relationship between mashup author and the creator of the original work and suggesting that perhaps this relationship can be mutually beneficial. While not the first artist to make mashups,[1] nor the first to face legal consequences,[2] Danger Mouse's situation gained significant media coverage and widespread support on the internet.

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[1] Despite the fame and controversy surrounding the "Grey Album", it is important to note that it is only one of many examples of the mashup form, ranging from remixes by contemporary artists such as 2 Many DJs, The Kleptones, and Girl Talk, and descended from earlier examples of artists such as Negativland and John Oswald's Plunderphonics. While in these works the practice of "sampling" (reusing snippets of existing songs) sits front and center, the use of sampling as an instrumental backing to vocals has had a long tradition in Hip Hop. This sampling culture can be traced to Jamaican Dub music pioneered by King Tubby and Lee "Scratch" Perry, who used remixes of existing recordings to create "versions" of songs. Beyond the field of music, examples of sampling and remixing can be found in William S. Burroughs' literary "cutups," in the collage art and poetry of the Dadaists and the "found art" of Marcel Duchamp, and the *détournement* of the Situationists.

[2] In 1991 rapper Biz Markie was sued (in "Grand Upright Music, Ltd v. Warner Bros. Records, Inc.") for sampling the song "Alone Again (Naturally)" by Gilbert O'Sullivan. The resulting injunction radically limited the use of sampling in mainstream Hip Hop, although underground sampling and mashups continued.

In the coordinated, distributed protests online—known as "Grey Tuesday"—websites attempted to spread digital copies of the album as widely as possible. While never released commercially, this "illegal" album became a cultural phenomenon (at least among those active on the internet or fans of hip hop and DJ music), later ranked by Entertainment Weekly as the best album of the 2004. With "The Grey Album", the term "mashup" entered the public consciousness.

The advent of desktop digital music editing and recording technology means that anyone can create their own music, and peer-to-peer file sharing and websites such as YouTube make it easy to distribute digital music to others. What is particularly interesting about the mashup phenomenon in music is that these mashups only consist of parts taken from existing songs, with nothing new added. Instead of sharing and downloading other people's songs, or recording and sharing one's own songs, the creative act lies in the act of manipulating digital media, rather than creating it.

The creation of links and relationships between existing works is a means for media consumers to actively engage in the surrounding digital landscape, while also expressing a kind of ownership over the digital objects in their lives, at a time when our interactions with the digital world are increasingly regulated and restricted. Lawrence Lessig argues that while the arrival of digital technology could unleash unprecedented levels of creativity and innovation, that creativity is threatened precisely because a computer's functioning is based, fundamentally, on its ability to make perfect digital copies (a process unavoidable in even the most basic computer tasks such as sending email, browsing the web, or word processing). The act of copying gives copyright law jurisdiction over a realm of creative production it had never been concerned with before. "It is noncommercial, amateur creative work—precisely the sort that has never been subject to the regulation of the law, but which now, because it is living in a digital context, is monitored, and regulated, by the law." (Lessig 2005: 196) Thus music mashups can be read both as a subversive act of unlocking or liberating information, in this case in violation of copyright, driven by the particular (and historically unique) contemporary legal setting, and also as the continuation of a long history in which all creative expression builds upon modulation and hybridization of earlier culture.

Paul D. Miller, also known as DJ Spooky, compares remixing of the digital media landscape with earlier attempts at creative engagement with the urban setting: "In 1960s Paris, the situationists initiated concepts like the *dérive* or psychogeography, but these days that sense of

wandering through an indeterminate maze of intentionality can become the totality of the creative act. Selection, detection, defining morphologies, and building structures, that's what makes the new art go round" (Miller and Lunenfeld 2004: 17). Miller makes explicit a connection between the sampling and mixing of media and the interpretation and representation of space, even the process of selection and construction inherent in cartography. What existed as a metaphor of spatial sampling for Miller in 2004 became a reality of online map mashups in 2005.

Similar questions of ownership, authorship and agency have resurfaced in recent years, as an explosion of World Wide Web mashups have appeared, in which users either mix data from various web sites or integrate their own data into existing webpages. As with mashups in music, the relationships between mashup authors and original creators are complex, with data providers at points of origin sometimes encouraging mashups, while at other times attempting to shut them down. Among the most popular web mashups are those based on the mapping services of Google, Yahoo! and Microsoft. These user-created web maps cover all manner of subjects, including personal daily experiences and travelogues (such as annotating a map with photos taken at that location); real estate and shopping guides (such as mashing classified ads onto a map); and political and community activism (such as mapping reported crimes in the neighborhood).

Strictly speaking, mashups online are hybrid web applications, combining disparate data sources and web services in ways that are not how they were intended. This definition, which mirrors the way the term “mashup” is used in music, appears to cover a range of online mapping activity, but leaves other kinds of online mapping outside the category of mashups. However, due to the newness of the field, the usage of these terms remains in flux, and common usage tends to employ the word “mashup” to describe any use of online mapping services, or sometimes only to refer to the use of Google Maps. One of the purposes of this paper is to disentangle the confusion of terminology, and, to the extent possible, retain a narrow definition of what constitutes a mashup in order to better understand the implications of this specific practice of remixing and recombination. To begin this inquiry, we will begin with a description of two of the earliest and best-known mashups, HousingMaps and Chicago Crime.

The First Mashups

In July 2005, Google released an API (or Application Programming Interface) for its Google Maps service, effectively unveiling a blank geographic canvas on which web programmers could begin to paint. As a detailed description of all the functions and instructions of the software behind the service, the Google Maps API provided developers with the means and opportunity to appropriate its data, interface, and iconography, which included among other things its pushpin icons, text balloons, as well as its zooming and scrolling frames and functions. Users could, therefore, generate new maps without having to write or host the mapping software themselves. Yahoo! followed Google's lead and released its mapping service API a day later, arguably inaugurating the era of mashups, in which customized mapping became available to anyone on the internet. Significantly, the first true mashups had in fact emerged months *before* this announcement, created by savvy programmers who had managed to decode parts of the then-unpublished but still accessible APIs. In response to these initial mashup activities, Google Maps product manager Bret Taylor explained that his company had ultimately published the API "because they were already doing it" (Singel 2005).

One of the earliest mashups was Paul Rademacher's HousingMaps.com, a combination of apartment rentals and houses for sale extracted from the online classifieds site craigslist.org, and displayed on Google Maps. On this site, housing ads are enriched through georeferencing, both in terms of pragmatic utility (helping users find accommodations in a given area more easily) but also in terms of the demographic insight which emerges from the large dataset on craigslist that documents a spatially significant human activity, namely the processes involved in the acquisition of housing.

HousingMaps was simple to create and instantly filled a need not provided by the original data source craigslist, exemplifying a new paradigm called Web 2.0 by Tim O'Reilly, a leading publisher of technical books and a trend-spotter in the computer industry. For O'Reilly, Web 2.0 refers to new interoperable, interlocking type of services, where web sites would provide components (either data itself or data processing services) rather than finite, one-stop experiences. Users in this paradigm would, therefore, be free to combine online services in any way they choose. "Google Maps with craigslist is the first Web 2.0 application," O'Reilly explained at his

geospatial Where 2.0 conference in 2005 (Singel 2005). In this way, HousingMaps may yet foreshadow the way users interact with the web in the coming years.

Adrian Holovaty's Chicago Crime[3] was, along with HousingMaps, perhaps the best known of the early mashups. The site displays crime reports from a feed available on the Chicago Police Department's web page and geocoded the reports onto a Google Map. Later, the site moved beyond simply identifying crime locations with colored pushpins and began linking the locations with stories from the Chicago Journal's police blotter, widening representations of space beyond plotted points to include narrative. The site received significant press coverage, winning an award for journalism for what one judge called "a pioneering integration of geomapping and a public database, [that] delivers one of the most comprehensive crime sites online."[4]

Both mashups originally relied on screen-scraped data from websites and were developed before the release of Google's mapping API, meaning the points were plotted by reverse-engineering Google's javascript. As such, despite their mainstream accolades, they relied on a hacker mindset. The need for a hacker's skill set also meant that creating these mashups was an elite venture, only possible for those with programming knowledge.

Terminology

In fact, these early mashups were also called "map hacks" or "mapping hacks,"[5] terms that were already in use in 2004 (the year before Housing Maps and Chicago Crime were released) by programmers Schuyler Erle, Rich Gibson and Jo Walsh in the website[6] for their book *Mapping Hacks* (subsequently published in 2005). These map hacks ranged from personal mapping of one's own GPS tracks to tricks for geocoding addresses; some of the map hacks could be considered mashups in that they plotted data feeds from other sources, such as earthquakes re-

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[3] On January 31, 2008, Holovaty shut down the original Chicago Crime mashup, redirecting it to EveryBlock, a new project with expanded functionality and coverage of more cities. http://www.everyblock.com

[4] 2005 Batten Award Winners: http://www.j-lab.org/batten05winners.shtml (accessed October 5, 2008)

[5] On the original website of HousingMaps, Paul Rademacher called his project a "Craigslist-GoogleMaps combo site", avoiding the emotional connotations of "hack" or "mashup."

[6] http://www.mappinghacks.com

ported by the USGS or health code violations, but usually using their own simple basemaps, rather than mashing the data onto existing maps such as Google's.

It should be noted that despite the negative connotation of the word "hack" in mainstream media, in computer circles a "hacker" is one who is particularly skilled in using or programming computers. A "hack" is either an exceptional feat of programming, or more often, a quick-and-dirty yet still skillful solution to a problem. A "cracker" on the other hand, is someone who illegally infiltrates computer networks, generally to cause mischief or damage (that is, what most people think of as a "hacker"). In the introduction to *Mapping Hacks*, geospatial free software developer Frank Warmerdam explains "To me, a software hack is something that can be done fairly quickly (in no more than an intense evening), is often a surprising or nontraditional use of technology, and gives a 'Wow!' feeling when it works" (Erle et al. 2005: xi).

While *Mapping Hacks* doesn't mention the word "mashups," a subsequent book by Gibson and Erle (2006) clearly defines mashups as a subset of mapping hacks, involving, as in music, combining two existing data sources, such as a news feed and a web map. The remainder of the book is devoted to mapping one's own data, or describing advanced techniques for dealing with Google Maps as a user, none of which are described as mashups. This continues with the strict definition of mashup: it must combine two or more existing data sources, even if one is a basemap (Google Maps, in this case) and one is a "content" layer (such as the data scraped from Craigslist or the Chicago Police Department). If one simply inputs data themselves into the Google Maps API, it is not, by this strict definition, a mashup. I will call this the "narrow" definition of mashups.

The question of terminology became further complicated by the term "neogeography," coined by Di-Ann Eisnor of the website Platial, and introduced into the literature in a technical book: Andrew Turner's *Introduction to Neogeography* (2006: 2). While the definition of neogeography will be addressed in chapter three, Turner's book is notable because, despite having a subject matter that largely overlaps with the books by Erle et al., it only uses the word "hack" once. Turner prefers instead to talk in terms of what "neogeography is" and what "neogeographers" do, generally using the unqualified term "map" to describe these projects. Turner uses "mashup" (or "mash-up") sparingly, defining it more broadly to cover websites based on the Google Maps API that allow 'developers and users to quickly and easily show geographically based data on shareable maps." I will call this the "broad" definition of mashups.

Bloggers and mainstream news sources have also shown inconsistent and shifting use of terminology. Mike Pegg's blog Google Maps Mania[7] has tracked the Google Maps hacking phenomenon since it began, becoming the preeminent index of Google-based mashups. Pegg's posts switched from using "Google Maps hack" to "mashup" around June 2005, and today employs a loose classification system of "websites, mashups and tools being influenced by Google Maps". Another influential aggregator of information about mashups is ProgrammableWeb,[8] which, through its focus on exhaustively indexing all available APIs (not only those of the major mapping sites, but also blogging, social networking, e-commerce APIs, and others) maintains a consistent use of "mashup" as a "web page or application that combines data from two or more external online sources." However, ProgrammableWeb's archive includes numerous examples of sites that only use the Google Maps API, not mashing it with APIs or feeds from any other sites. In a recent article, Jack Dangermond (2008), CEO of GIS software company ESRI, makes a distinction between "mashups" (combining web services) and "consumer map visualization" (that is, using a map API to plot your own data on a map; Dangermond is careful not to call this "map making"). In this sense, the projects on ProgrammableWeb that use no service other than Google Maps would not fit Dangermond's definition of a mashup (nor, strictly, ProgrammableWeb's own definition).

As should be expected, differences in use are clearly evident based on the position of the writer and their target audience. The books by Erle et al. are written for a target audience of self-identified hackers (those experienced with computers and software, but perhaps not with geography), and hence do not shy away from using the potentially controversial term "hack."[9] Turner's *Introduction to Neogeography*, and its use of the unqualified "map" instead of "map hack" or "mashup", fits its position as an introduction to non-experts and is apt for a community of "neogeographers" who do not claim experience (or, perhaps, interest) in the different kinds of maps

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[7] http://googlemapsmania.blogspot.com

[8] http://www.programmableweb.com

[9] One could speculate at reasons why "mapping hack" has fallen out of favor, such as negative connotations of "hacking", or perhaps an unfortunate overlap with the usage of the term in video gamer circles, where a "maphack" is a cheat in multi-player computer games in which a user manages to see more of the field of play than they are supposed to, thereby gaining advantage over their opponents. One could also argue that the change in terminology is appropriate, because after the release of mapping APIs by the major web mapping providers, making maps online was no longer a matter of hacking JavaScript code to make it do something it wasn't designed to do.

or mapping as understood by professionals. Meanwhile Dangermond is careful to talk of "consumer map visualization" rather than Turner's "maps", speaking as the head of a corporation in the business of selling software to make professional maps and not wanting to dilute the term by including map mashups online. Similarly, his description of mashups as combinations of "services" and not "sources" or "sites" fit's with ESRI's growing desire to position itself as a provider of these services.

The emergence of Web 2.0 cartography has also come to the attention of academic geographers, some of whom have distinguished "map hacks" from "mapping mashups" as in Crampton and Krygier (2006) and Monmonier (2007), although the latter also states that mashups can integrate the user's own database with Google Maps, as well. In *The Geospatial Web* Scharl narrowly defines mashups as combining "services from multiple providers into an integrated user experience" (2007: 5), while a later chapter by in the same book describes mashups broadly as applications where users "combine their own data with the base cartographic data" (Rouse et al. 2007: 155).

Goodchild (2007b) also followed the increasingly common usage wherein a mashup is considered any overlay of data (whether sourced from another web service, or contributed by the user) on a web map, but in a later article he expresses more nuanced use of the word: "The term mashup has become the preferred way of referring to the linking of Web services through common references, and georeferences are clearly one of the most powerful and ubiquitous bases for what is essentially a generalization of the concept of a relational join" (Goodchild 2008).

Among the various uses of "mashup" we can perhaps identify gradations of the term, based on the techniques used and the data sources involved (although the source and format of the data source tends to drive the selection of technique):

1. Mashups that screen-scrape data in violation of Terms of Service agreements or that otherwise hack undocumented javascript code to accomplish mapping. Perhaps closest to the original sense of mashups in music, this type of mashup challenges the ownership (or, at least, control) of data and, in some cases, expresses a "hacktivist" stance, wherein the use of hacking and "liberating" data is employed with the goal of challenging corporate or government authority. Examples of this type of mashup are scarce for two reasons: the original

websites may take legal action to shut down the mashup, or they may eventually agree that the information should be made public, providing it in more easily mashed APIs.

2. Mashups that screen-scrape data that is publicly available (in a legal sense), but which is not provided in a machine-readable format. As in the first case, hacking is employed to create a service that didn't exist before, using a site not how it was expected to be used. These mashups may screen-scrape or hack other sites in order to make them more functional or remove bothersome advertisements, or to create a searchable database of results for a particular query when the original website only provides results one at a time, as is sometimes the case with data that governments are legally required to published, but not necessarily in a convenient format. The original HousingMaps and Chicago Crime perhaps best fit into this category.

3. Mashups that use RSS feeds and APIs of third party sites to acquire data. This includes most of the mashups on ProgrammableWeb. Unlike the original sense of mashup, these sites use online APIs exactly as they were intended, but the juxtaposition of the data may still producing surprising results.

4. Mashups that only use a mapping API, but include general-interest user-uploaded data gathered from some other source. This second source is not from an API, and perhaps not even in a digital format, such as a user typing in locations from printed documents. This increasingly drifts away from the original sense of a mashup, for these mashups use the map API just as it was intended. While these mashups still give their creators the new and powerful ability to explore spatial patterns in the surrounding datascape, the creator's role is more passive, no longer participating in the engineering of the web, with no sense of "rewiring" the network. The user participates on the level of content only.

5. Mashups that only use a mapping API, and map only personal interest data. The ability for the user to create, share, and explore data that they create themselves is, again, a significant change from the past, and one that will be addressed in later chapters. However, despite this ability for spatial introspection and publishing, these mashups are passive when it comes to other datasources. They are read-only consumers of the rest of the data that surrounds them.

Finally, there exist the variant linguistic constructions of "map mashups", "geomashups", and "mapping mashups", which appear to be used in the discourse to refer to essentially the same concept. I will avoid the term geomashups in order to emphasize the fact that these mashups operate on and create *maps*, visual representations of spatial relationships, which, in some cases, may not even involve the earth's surface as in geography. Furthermore, this paper will favor the construction "mapping mashups" which I feel better reflects the dynamic, open-ended nature of these mashups, rather than "map mashups", which, in contrast to the fluidity inherent in the idea of remixing, suggests a static source material as in music mashups and the non-digital precursors to mashups of collage and even the cut-up psychogeographic maps of the Situationists. The active term "mapping mashups" also has the lucky dual meaning that reflects that the act of creating a mashup is itself in many ways an effort of mapping, of exploring a "terrain", and observing and representing patterns and connections between things. This sense of mashups as a knowledge-seeking venture will be further discussed in chapter five. Also, unless clearly stated otherwise, this paper will use "mashup" and "mapping mashup" interchangeably, although this is purely for the sake of simplicity and is not meant to deny the existence of other non-mapping forms of mashups.

Why Do Mashups Matter?

Ultimately, however, mashups may soon (or already have) become so integrated into the fabric of our experience of the internet and geospatial information that the term may no longer be meaningful. In the future we may seamlessly combine, contextualize and share all manner of information in such fluid ways that the distinction between mashed-up and non-mashed-up data may be an irrelevant one. Or, there exists the looming possibility that these developments will be shaped, controlled or restricted by social, economic and cultural forces in ways that further restrict the ability to remix and mashup disparate data sources. In either case, a discrete field of "mapping mashups"—if it has ever even existed discretely at all—may thus be a brief historical window, a small blip during which technology and social practices were temporarily unsynchronized.

Given these possibilities (whether dreams or nightmares) of future convergence, it may be a pointless effort to trying to settle on what a mashup is or is not. Nor is it my position or de-

sire to force a specific use of terminology. However, I still consider it fruitful to trace how people use the term to talk about the technological state of Web today, and how the differing uses of the term reveal how people think about these technologies, and thus take part in shaping subsequent stages in the evolution of the web.

So while I do not want to argue for the word "mashup" to be retained in its specific, original sense, I do think the narrower definition is useful as a metaphor; just as the mapping mashups that are the subject of this thesis are themselves inspired by (or, at least through metaphor, understood through) music mashups, so can they also be applied as conceptual frameworks for other fields of knowledge and expression. Just as the idea of the Creative Commons (discussed later in this chapter) is a modulation of Free Software practices (Kelty 2008)—an experimental application of its concepts onto the social field—the idea of remixing can also be a strategy for individuals to engage further in co-creation of the arriving information society. As Karl Palmås argues that the computer network has become the organizing metaphor for society (von Busch and Palmås 2006), so might the mashup represent a means of expression and communication emerging from and suited to a networked society.

While user-generated information and customized personal mapping (the online mapping practices that are included in the broad definition of mashups, but excluded from the narrower definition) are significant advances made possible by computers and networking, they also clearly fall in a lineage of linear communication, only now, theoretically, available to more people. These fall into the trajectory of underground, self-published *samizdats* and zines[10], now made easier and more widely spread by computer technology. In this sense, user-generated personal geodata finds its non-spatial analogue in blogs. The mashup, through its mixing and synthesizing of existing data, suggests a means for these individual expressions to build on one another.

Mashups and the Geoweb

The search for a genealogy of mashups leads to the question of how mashups relate to a related concept: the Geoweb. Some use "Geoweb" or "The Geospatial Web" (in almost all us-

[10] *Samizdats* were typed or hand-written illegal publications shared among dissidents in the former Soviet Union. *Zines* are low-quality non-commercial magazines, generally reproduced by photocopier, that peaked in popularity in the United States in the 1980s and early 90s.

age, these two constructions are perfect synonyms) to encompass the world of user-generated content and tools such as mashups, a sense almost interchangeable with "neogeography," but this use is in the minority. Generally, the Geoweb is used more simply to refer to "the ability to locally/globally integrate and share geospatial information via the Internet," as defined by the organizers of the annual GeoWeb conference.[11] Using this definition, which only specifies what the Geoweb *does*, not what it *is*, mashups would appear to be a subset of the Geoweb, which the theme of the 2007 conference, "From Mashups to Infrastructure," makes explicit.[12]

The book *The Geospatial Web* is the first major academic work to attempt a comprehensive survey of the technologies and tools underpinning the Geoweb. In the Foreward, Patrick J. Hogan writes "the daunting challenge of the Geospatial Web is to seamlessly integrate and display vastly difference information modes." Unlike the definition put forward by the Geoweb conference, the *Geospatial Web* text leans towards a focus on 3D geobrowsers (digital globes such as Google Earth, Microsoft Virtual Earth, and NASA World Wind, inspired by Al Gore's (1998) call for a transition from a desktop metaphor in computing to a "Digital Earth") as the key enabling technology for the sharing and synthesis of geospatial data from diverse sources on the web. This appears to exclude the web browser-based (not "geobrowser") map sites such as Google Maps that are the basis for most mashups.

The foundations for this geobrowser-based Geoweb were under construction well before the arrival of mashups, developing largely unnoticed by the public (Rouse et al. 2007). These government, academic and military projects were largely directed towards the implementation of standards promulgated by the Open Geospatial Consortium,[13] specifically GML (Geography Markup Language), WMS (Web Map Services) and WFS (Web Feature Services). These complex formats handle the exchange of geospatial information in precise ways, defining additional metadata such as the data's projection that is essential for use in professional contexts. The explosion of online mapping that occurred with the release of Google Maps (and competing search engine map services) was not based on these technologies, but on Google's JavaScript API, Google Earth's KML format, and lighter-weight protocols such as GeoRSS (Singh 2004). These

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[11] GeoWeb 2008 Conference. http://geowebconference.org/about-geoweb-2008/about-geoweb-2008

[12] GeoWeb 2007 Conference. http://2007.geowebconference.org/

[13] Open Geospatial Consortium. http://www.opengeospatial.org/

formats generally do not include metadata, are easier to edit and produce, but are generally less suitable for professional use.[14] In this sense, the Geoweb made up of GML, WMS and WFS has remained the domain of experts, largely separate from the world of mashups and web mapping experienced by most web users.

Corporate and government organizations have been interested in the Geoweb for processing and storing geodata on the web, but they also have a vested interest in maintaining the value of their data through control, and institutional inertia regarding their own software systems. Mashups represent a much looser direction for the evolution of the Geoweb than most of these institutional actors would prefer. Quality control is a major concern, as institutions are concerned about errors that could be introduced if they open up their data for collaboration. Also, corporations are interested in attempting to monetize their data assets; similarly, most government agencies that are data providers (with U.S. federal agencies as notable exceptions) are tasked with obtaining some amount of cost recovery to compensate for the taxpayer investment in gathering the data in the first place. In some cases, such as the UK's Ordnance Survey, national mapping agencies are semi-public profit-making ventures, given the contradictory goals of providing a public service through mapping, but also limiting access to those maps in order to make money from them.

The Cost of Data on the Geoweb

At this point, it is instructive to return to the issue of digital copying of music and other creative works, and compare it with the legal status of digital content on the Geoweb. At first glance, the situation appears vastly different from the music industry, where large record companies have revenues of billions of dollars at stake, and are waging a legal fight against peer-to-peer file sharing and illegal sampling (Lessig 2005). In the geospatial field, such lawsuits are fewer and farther between, and web map services appear to be falling over themselves to provide more free data and services online. But upon closer inspection, the amount of money involved in online mapping is striking: intense bidding wars during the recent purchases of the two commercial suppliers of global street network data, Tele Atlas (acquired by GPS manufacturer TomTom for

[14] For example, Google Maps uses a spherical Mercator projection. Using a sphere instead of a properly calculated geoid results in much faster and simpler calculations for online mapping, but would also produce unacceptable levels of error in positional accuracy if used in professional applications.

€2.9 billion in 2007) and Navteq (acquired by mobile phone manufacturer Nokia for €5.7 billion in 2008), while Google recently spent an undisclosed sum for the exclusive rights to imagery from the GeoEye-1 satellite launched in September of 2008. So, while this data is freely available by Google, it can only be used in ways sanctioned by the Terms of Service agreement. Harvey (2007) discusses the limitations on scientists who wish to use these corporate basemaps for their analyses; for the public the situation is at least as grim. Crucially, deriving locations from the free Google Maps service—already problematic in terms of accuracy and described by Goodchild (2007b) as the "Google datum"—is technically forbidden, fundamentally preventing the creation of new content based on Google Maps.

Do mashups create new content? In a legal sense, are they a new work? Early mashups (from 2005 and 2006) created a new service, a new webpage, a new geographic representation, but (as I will describe later) they are impermanent, and the "service" was generally useful only to a human consumer, not to further computer analysis. As necessary as it was for the mapping sites to provide APIs and for content producers to generate RSS and GeoRSS feeds, few mashup authors had the need or ability to provide their own APIs or mashed RSS feeds in turn, providing raw material for the next generation of remixing. Beginning around 2007, Google's Mapplets and Yahoo! Pipes (discussed later in chapter four) began to open the door to chaining of mashups upon other mashups. Without the use of data licenses such as Creative Commons, it would be difficult to know the legal status of the mashup from the point of view of a downstream mashup that wishes to use it as an input stream.

The Cathedral, the Bazaar, and the Commons

In the case of mashups and the Geoweb we begin to see services that are *cost-free* to use (that is, no monetary cost) but which the user does not have the *freedom* to use as they wish. This distinction between monetarily free and free as in freedom come up often in the open source software movement. Open source software is free, both free to copy, but also free to modify and use as desired. Despite the greater economic resources of proprietary software, open source software is often comparable or superior in quality, due to its openness. Because the code to the software can be seen and modified by all, every user is empowered to participate in fixing bugs and adding features. Open source code can be hacked and remixed, and used as the basis for

other software projects; thus open source software was a natural precursor and inspiration to online mashups. These opposed proprietary and open source paradigms are sometimes called the Cathedral and the Bazaar, from the title of a book by Eric Raymond (2001). Another interpretation of the metaphor, however, points out that the bazaar is still a marketplace, and software development (or government) through the bazaar is little more than a re-hash of Adam Smith's invisible hand of the market. This connection may not be coincidental; many adherents of the free software movement, Raymond included, also identify strongly with the philosophy of free-market libertarianism.

The open source movement is also known by many as the "free software" movement, a term preferred by Richard Stallman and the Free Software Foundation, and the ideas of freedom and what is "free" recur frequently in its discourses. Many in the movement have used variations of the following phrase to clarify its priorities: think "free as in speech, not free as in beer". The financial cost of software, while important, is not the motivating cause. Others prefer to make the distinction by contrasting "free" and "*libre*"—and pointing out that free software should be both—thus creating the long yet necessarily complex umbrella term FLOSS, or Free/Libre Open Source Software. The "free speech" definition of freedom emphasizes that there should be no restrictions on what the user does with software or data; they should be free to express themselves how they see fit, and use the software and data how they choose. This is the libertarian view, and taken to extremes, begins to blur the distinction between free speech and free beer. In this sense, both forms of freedom ultimately exist at the individual level: to speak your mind or take the beer and drink it. Free speech does not contain within it any social obligation, or sense of how free speech is useful in building a bazaar or a cathedral.

We might glibly recall the adage that "free speech doesn't give you the right to yell 'Fire!' in a crowded theater." Perhaps something similar is at work in the ideas of free speech in the free software movement; in truth, it is not purely anything-goes libertarianism. While staunchly against the idea that software can be patented, most free software projects include licensing that has some restrictions on its use; the restrictions, however, only prevent the software (or modifications to it) from becoming proprietary or closed source. The pre-existing legal framework of copyright is used to release all rights to the software, with the only condition being that the software and any derivative versions are released under the same license. This inversion

of traditional copyright law (yet, still having the full force of the law) is known as "copyleft."[15] These licenses are sometimes called "viral," because of the way every derivative or combined work becomes "infected" by the same license.

The application of viral licensing is now being applied to creative works and representations of information. Founded by Lawrence Lessig, the Creative Commons organization has created a series of copyleft licenses that people can easily apply to any electronic content that they create. Thus, you can remix and reuse any content that is appropriately licensed according to the Creative Commons, but you must then make your remix available for subsequent remixes. The use of copyleft builds in a solution to the new electronic tragedy of the commons. In the original tragedy of the commons, people had no incentive to maintain the common land, polluting or over-exploiting it. Electronic commodities are inexhaustible, so everyone can take from the commons without depriving others; and yet, there remains no incentive to maintain or improve upon the content of the commons. As soon as anyone takes a copy of the information, that copy becomes theirs, and any improvements remain theirs alone. By applying copyleft to the electronic commons, it acquires a kind of reality, a concreteness, while retaining its inexhaustibility. Everything taken from the commons remains a part of the commons, which not only retains the same amount of contents, but grows, as subsequent improvements and additions are added. As with the historic case of a real world commons, a community must form around electronic commons, only instead of being faced with the task of preventing overuse of a scarce shared resource, they have the welcome task of managing an ever growing shared resource in common.

A Data Commons

Creative Commons licensing provides a legal framework for a mashup ecosystem. Certainly, many mashup authors won't concern themselves with operating within any legal bounds, continuing to remix and build on data from proprietary sources. Similarly, many amateur data producers won't want to be bothered with the overhead of figuring out which license to use, and will continue providing their data without a license. These practices will continue as long as the current state of affairs in the mashup ecosystem satisfies all their needs. However, for those who want to create mashups that are robust, that build on others' work legally, and encourage others

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[15] "What is Copyleft?" http://www.gnu.org/copyleft/

to build on their own work while still giving credit to the original author and returning any improvements back to the community, some social compact is needed. For mashups to operate within the field of establish institutional actors in the realm of the Geoweb, this compact must be a legal document.

Even if Creative Commons-licensed data and mashups can operate on a (theoretically) level playing field with other geodata projects, institutions with concerns about cost recovery will still be unlikely to take the initial step of releasing their data into the commons. U.S. federal agencies (as mentioned earlier) do release their data freely, but into the public domain, not into the commons. While this benefits the end user, it does not benefit the government, because it has no right to get back any improvements that others make on the data. While some other governments and businesses are shifting their stance towards the idea of the commons, most continue to focus primarily on cost recovery. However, as the geospatial data commons grows, producing data that is an increasingly acceptable alternative, these institutions may find that their efforts towards cost recovery become ever more fruitless. Tim Berners-Lee, recognized as the inventor of the World Wide Web, made the point directly in speech to the UK's Ordnance Survey (Berners-Lee, quoted in Mathieson and Cross 2006):

> If you don't make [lower-resolution mapping data] publicly available, there will be people with their cars and GPS devices, driving around with their laptops. They will be cataloguing every lane, and enjoying it, driving 4x4s behind your farm at the dead of night. There will, if necessary, be a grass-roots remapping.

This vision is already coming true. An organization called OpenStreetMap is actively repurposing GPS to create their own maps, released into the Creative Commons. As the OpenStreetMap expands, the Ordnance Survey's maps will lose their value, bringing a fait accompli end to any kind of cost recovery. Due to the lack of acceptably-licensed basemaps, OpenStreetMap had to make a free alternative, free to edit, add to, and build mashups on. The Creative Commons is not only the framework by which mashups can be built on top of OpenStreetMap, but it is also the organizing system under which large numbers of volunteer contributors could coordinate in building an enormous project such as a street map of the world.

While OpenStreetMap is not itself a mashup (by even the broadest definition), it illustrates how mashups and user-created geographic content are distinct concepts but are mutually inseparable. In particular, user-created data requires other data either as source material (such as deriving locations from satellite imagery, for example) or as context (because GPS points with-

out a basemap mean little on their own). In the following chapter I continue this exploration of user-generated content, moving away from the legal perspective and further into issues of accessibility, accuracy, and expertise.

Chapter 3: Mashups, Neogeography and GIS

Web 2.0 and User-created Content

While a core part of Web 2.0 is the idea of interconnected services (as defined by Tim O'Reilly (2005) and embodied in the idea of the mashup), the perhaps more significant change has been the rise of user-created content and social networking. These advances in many ways go hand-in-hand. During the 1990s people had "home pages" and the use of hyperlinks provided an earlier form of networking, but the later development of blogs (whose explosion in use was significantly helped by the Web 2.0 framework of RSS feeds), and social networking sites like Friendster, Orkut, LinkedIn, MySpace, and Facebook not only made it easier to create a personal web presence, but also easily facilitate exchange of information with friends and acquaintances. Sites such as YouTube allow sharing of content with everyone, not just within social networks, and social bookmarking sites such as del.icio.us, Digg and StumbleUpon enable the sharing of links with friends and like-minded strangers, forming a rich layer of interconnected annotations and tags on top of the "content" layer of web pages and multimedia. Finally, user-editable websites known as *wikis* have facilitated the collaborative development of large, complicated projects, of which the most notable is Wikipedia, a free encyclopedia created and maintained completely by volunteers.

This revolution in user-generated content has entered the geospatial realm just as powerfully as it did in the field of news and reference. The mapping APIs of Google Maps (and others) combined with the increasing availability of consumer GPS (embedded in everyday objects like mobile phones and cameras) has resulted in an explosion of user-generated data and user-created maps of that data.

Neogeography and Volunteered Geographic Information

These developments are associated with the term "neogeography," mentioned in the previous chapter, and explored more fully here. Neogeography is itself linked to the term mashup, and equally difficult to define. Coined in 2006 by Di-Ann Eisnor (Jackson 2006), a founder of Platial.com, a site where users create and share their own points of interest, neogeography is:

> a diverse set of practices that operate outside, or alongside, or *in the manner of*, the practices of professional geographers. Rather than making claims on scientific standards, methodolo-

> gies of neogeography tend toward the intuitive, expressive, personal, absurd, and/or artistic, but may just be idiosyncratic applications of "real" geographic techniques. This is not to say that these practices are of no use to the cartographic/geographic sciences, but that they just usually don't conform to the protocols of professional practice (Eisnor 2006).

Andrew Turner, writing *Introduction to Neogeography* later that same year, defines the word as "a set of techniques and tools that fall outside the realm of traditional GIS [...] essentially, it is about people using and creating their own maps, on their own terms and by combining elements of an existing toolset. Neogeography is about sharing location information with friends and visitors, helping shape context, and conveying understanding through knowledge of place" (Turner 2006: 3). Writing a book designed to demonstrate software techniques for neogeography, Turner's definition begins to shift the emphasis of the term away from the expressive, humanistic language used by Eisnor and towards a technological definition.

As with the term "mashup", "neogeography" has continued to be interpreted in multiple ways. From one point of view, we see in the provocatively titled paper "A Demo Playlist of Geo-mashups for Public Health Neogeographers" by Boulos et al. (2008) the idea of neogeography as a toolkit of handy online visualization and analysis tools. This definition partially matches Turner's, but bears little resemblance to Eisnor's neogeography of impressionistic, non-scientific data and practices.

For Sui (2008), neogeography is "Geography without Geographers," comparing the situation to the relationship between professional journalists and the bloggers now taking on the role of citizen-journalists. By this definition, neogeographers are amateurs taking on subjects that previously were the purview of professionals; OpenStreetMap might be a good example of this kind of neogeography. However, this appears to run counter to Eisnor and Turner's conceptions of neogeographers, who seemed content to leave the subject matter of traditional Geography to the experts. The kinds of tools that are available to the public are also a contributing factor. Geographic Positioning System (GPS) receivers are a professional technology that is now available to the consumer; it is a device that gives an amateur a professional level of accuracy without having to learn the skill of surveying. Without GPS, a project like OpenStreetMap would be much more difficult. Other subfields of Geography may be harder for amateurs to experiment in, particularly if there is no technical tool that gives a user near-expert skills, or if those tools remain prohibitively expensive. In other cases, inexpensive sensors exist, such as simple weather

instruments, where amateurs can create "Geographic data without Geographers," to permute Sui's definition, but where amateurs do not have the skills to perform complicated analyses with their data.

Mike Goodchild has coined the term "Volunteered Geographic Information" or VGI (2007a) to encompass these Web 2.0 data sources, as seen from the point of view of information infrastructure and professional Geography (not from the amateur's point of view, as in Eisnor and Turner's definitions). Here VGI is a potential resource to be tapped, augmenting traditional geospatial data sources with user-contributed information. In this sense, we might ask whether all neogeography is VGI, or only the "useful" parts? If VGI refers only to amateurs working within the realm of traditional geographical concerns (mapping infrastructure, or making environmental observations, for example) then might "neogeography" be productively returned to its original sense, referring only to subjects outside the traditional borders of Geography?

GIS and Society

So far, most geographers have been enthusiastic about the geospatial technologies making their way into the hands of the public. Francis Harvey, while expressing concern about corporate control over both software and data (issues explored here in the previous chapter) writes:

> Most academics working with GIS are inclined to hold that Google Earth, Virtual Earth, and similar specialized web browsers for viewing and querying earth imagery and georeferenced data (aka virtual globes or virtual earth browsers), are one of the greatest boons for GIS since the digitizing tablet. Finally any Jane or Joe can experience the visualization and analysis capabilities of GIS that have remained the purview of specialists for years." (Harvey 2007: 761)

Monmonier also takes an enthusiastic view, but also includes a few other caveats about the technologies making their way into the hands of the public, specifically that online maps and geobrowsers privilege style over usability, and that they can be problematic in terms of reliability, "especially for way-finding web sites like MapQuest.com, notorious for suggesting creative ways for getting lost" (Monmonier 2007: 373). Other GIS professionals have expressed deeper concern, not just that online mapping sites might lead to to the wrong place, but that they actually discourage spatial thinking and increase dependence on turn-by-turn directions. Some worry, strangely, that the "effortless" interaction with Google Maps has spoiled users for older digital or printed forms of cartography (Peterson 2008: 9). In many cases, these complains can be traced to worries about job security: essentially, these web-based technologies may lead peo-

ple to think that they no longer need the services of expert geographers or cartographers (Hall 2007).

However, these examples give the impression that whatever their different concerns with the phenomenon of mashups and neogeography, geographers are at least uniformly confident in the accuracy and reliability of their own GIS-based techniques. This is, of course, not the case. GIS has been a subject of critique from within Geography, particularly during the 1990s, pivoting on the book *Ground Truth*, edited by John Pickles (1994). "*Ground Truth* and related publications unveiled GIS that serves corporate and state interests, facilitates surveillance and control; masks social and economic inequality, deepens the digital divide, and is undemocratic as a result of its high cost, limited access, and need for expert knowledge; supports the pretense of value-free objectivity; has a masculinist bias; and so on," writes Pavlovskaya (2006: 2009), tracing the bounds of a decade of debate, chronicled in depth in Schuurman (2000), Sheppard (2005), and others. The specifics of the argument do not need to be revisited here, although more recent papers by Schuurman and Kwan (2004) and St. Martin and Wing (2007) remind us that the debates live on.

Responses to the *Ground Truth* critique included calls for an evolved version of GIS called "GIS/2", which could, in theory, incorporate different data types and perspectives that reflect more uncertain, ambiguous and situated views of space, and an increased focus on Public Participation GIS (PPGIS), an effort to supplement GIS (and any GIS/2) with practices of communication and greater engagement with disadvantaged community groups (Sheppard 2005). A working group on GIS/2 developed five requirements that a GIS/2 should fulfill: (Schroeder 1996)

1. Increase "the role of participants in creation and evaluation of data."
2. Accommodate diverse views, "preserving contradiction, inconsistencies and disputes against premature resolution."
3. Produce output "redefined to reflect the goals and standards of the participants," rather than fitting some definition of "measurable" accuracy.
4. Manage all data components in a single interface.
5. Make visible the history of its own development, and in general provide better support for time-based data.

These five requirements are geared mostly towards issues of technical implementation, implying that differently-written GIS software would result in different social outcomes. But many of the requirements could also be satisfied (at least partially) through diligent use of existing GIS software. An example of this approach is Schuurman's Cyborg Manifesto for GIS (2002). Schuurman calls for a feminist engagement with GIS, helping to "write the cyborg" in Haraway's (1991) terms by establishing a practice of GIS use informed by feminism and social theory and fully aware of the fallibility of GIS. Schuurman's call is primarily for a social rewiring of the networks of practice and scholarship surrounding GIS.

Sieber (2004) builds on Schuurman more literally, calling for reprogramming and rebuilding of GIS software to create a GIS/2. Sieber lists several ways in which a "rewiring for GIS/2" has been attempted, although these were generally external to the technology of GIS itself, or overly complicit in the inertia of large GIS software companies such as ESRI. Sieber calls for a complete rebuilding of GIS, down to its fundamental data structures, and relying on UML (Unified Modeling Language) and XML (eXtensible Markup Language) for flexible, user-defined classification and structuring of data. Built upon this UML and XML data model Sieber proposes modular, uncoupled software components for analysis and visualization, recognizing different user groups and different tasks are not all best served by one software solution. These components can be linked, recombined, and adapted as is necessary for any particular task and user group. Here Sieber reflects the contemporary trends in information science and on the internet, preceding prefiguring the rapid changes about to occur with the advent of mashups in 2005.

Mashups as GIS/2

Christopher Miller (2006) explicitly makes the connection between mashups and GIS, suggesting that mashups themselves may already represent the GIS/2 we have been looking for. Miller critiques Sieber's outline of a GIS/2 as the next in a long line of overly complex, overly abstract attempts to fix GIS, but which never produce a real-world example that completely lives up to the promise of a GIS/2. Miller suggests that mashups already have fulfilled the requirements, using the example of Scipionus.com, a mashup created in the immediate aftermath of Hurricane Katrina. Scipionus operated like a simple message board, displaying nothing but a

map full of push-pins which, when clicked, reveal brief, text-only messages left by residents of New Orleans. Some messages were from people still in the city, reporting on the depths of the floodwaters and assuring their families that they are okay, while other messages were placed by those who had been evacuated, requesting news about a loved one or asking that someone rescue the pet they left behind. The deceptively minimalist site, developed in an evening by Jonathan Mendez and Greg Stoll, was easy for anyone to use, as long as they had internet access or could get a message to someone who did. In a matter of hours, two programmers produced a mashup that is accessible to all, represents diverse voices equally, relies on the public for its data, and suited to the public's goals; after ten years of failed attempts by academic geographers, this mashup succeed, according to Miller, in creating a GIS/2.

One reason Scipionus succeeded was its limited options for input. Essentially, users on the site could specify a place and a text message, nothing more. Miller points out, correctly, that Google Maps can be made to include hyperlinks, media clips, or almost any other form of data, which would fully satisfy the fourth requirement for GIS/2, but this would not only have made the site more difficult to deploy with as much agility, it also would add an unnecessary burden on the users of the site. Even given the limited cartographic vocabulary of push-pins, Scipionus could have presented a complicated tagging scheme that would produce different colors and symbols on the map. One symbol might represent reports on the ground, another could represent requests for information, the symbols could be color-coded according to the type of request, and so forth. This categorization scheme could have been chosen by the developers, but it would still suffer from the problem of misclassification (especially because the developers were based far from the disaster itself, and might not know what classification would be relevant). Additionally, the more complicated the interface becomes, the longer it would take for users to learn the scheme and submit their data. A classification scheme appropriate to the situation could also be created on the fly by the group itself, using some kind of UML and XML (along the lines of Sieber's proposal), but this would produce even more of an up front burden for users of the site.

This dilemma between usability on the one hand and more complicated and responsive data structures on the other hand is not often addressed in the literature on GIS/2. As the possibility for well-tailored ontologies increases, it either means the groups using GIS/2 must take longer and longer to learn the system, or they are increasingly dependent on expert assistance. It

is almost as if the requirement that GIS/2 be able to represent multi-vocal, contradictory information results in multi-vocal and contradictory design requirements.

By allowing nothing but a blank text field, Scipionus relied on each users's human ability to scan the messages to find what they are looking for more efficiently than a computer could search for it. Had a more complicated classification been needed, it might have formed naturally in a kind of "folksonomy," that is, a taxonomy that emerges from the bottom-up. Folksonomies can be thought of as the neogeographer's answer to heavy-weight UML modeling. Emerging from a mass of information tagged independently by members of a group of users, these informal classifications (if not complete ontologies) grow up naturally via the crowd rather than from the top down by a PPGIS researcher.

Folksonomies may converge on standardized tagging schemes, as individuals find that it is easier to search for data if they use the same keywords that the majority of the group is using. Similarly, individuals who don't tag their own data with commonly agreed-upon terms will find fewer people accessing their data. Folksonomic tagging can be written in natural (human) language, or in semi-formalized "microformats" that are easily written by humans but also machine-readable (but where any metadata, such as the relevant coordinate reference system, is omitted or left implicit).[16] Thus, while folksonomic tagging is meant to lower the burden on the data producer, allowing for tagging that is easy to use and suited to the individual's needs, there is a constant social and technological pressure to conform to a standard. Taken to an extreme, a folksonomy could become sufficiently rigid to be indistinguishable (in terms of speed of use and intuitiveness) from a taxonomy devised by an expert.

To be fair, no one would rationally propose that the victims of Katrina should have been offered a system that required them to form their own UML ontology in the middle of a disaster. And to be equally fair, if more advanced filtering and searching of the Scipionus messages were necessary during the disaster itself, then relying solely on a folksonomy might be equally unrealistic. Fundamentally, Scipionus demonstrated what could be done with a minimum of programming and expertise, and re-opened the discussion about the future paths of participatory computer-based mapping.

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[16] Using the common "geo" microformat is simply a matter of writing the latitude and longitude of a place in a line of HTML code: University of British Columbia: 49.266; -123.256 . The WGS84 datum is implicit. See: http://microformats.org/wiki/geo/

The Digital Divide

The problem of differential access has been another critique of conventional GIS (Pickles 1994). GIS is expensive (in terms of monetary cost and technical skill), which changes the way some groups operate, and puts it out of reach of many other groups, such as most community organizations. Its cost has also lead the GIS industry to customize its products to the certain kinds of groups that can afford it, namely governments and planners, at the expense of community groups. Mashups are cheaper than true GIS, which is a boon to smaller or disadvantaged groups. Community organizations do not have to buy software, datasets, or pay for extensive training. Since mashups are, in theory, easier to use than GIS, more people can be involved creating them, leading to more equal power within the organization.

However, as discussed in chapter two, many of the "free" services online have other drawbacks, in terms of the licensing terms under which they are made available. Chapter four discusses this issue further, showing that the use of free online mapping frameworks such as Google Maps can come with a loss of control, both over how data is represented, but also where, how, and for how long the data is stored. It is important to examine the motives of any service that provides online services for free and encourages the free sharing of content, Lovink argues, describing "the cynical logic of do-good vulture capitalists" (2007: 247) who profit from selling the expensive telecommunications infrastructure that makes free content possible. Recent moves by broadband providers to create multiple tiers of internet traffic, with priority routing available at a price, would relegate mashups and other free content to a slower, less reliable internet, a proposal contested by the Net Neutrality movement. Finally, even if using free online tools offers sufficient features and control for a prospective mapmaker, there remains the fundamental digital divide of the end user's internet access, both for consumers and creators of mashups. If someone doesn't have access to the internet, none of these other problems matter.

The digital divide is becoming visible geographically in the uneven levels of Web 2.0 activity visible around the world. Geocoded image files can be browsed on a map on on many photo sharing sites such as Flickr (discussed further in later chapters) and in geobrowsers like Google Earth, giving a panoramic view of geographic space through the eyes of millions of photographers worldwide, but it is a view that is, inevitably, weighted towards the places where peo-

ple are more likely to take photos. Panning across a city, it is not surprising to find clusters of photos taken around popular points of interest; Girardin et al. (2008) have leveraged these databases of geocoded photos to study the movements of tourists within and between cities in Europe. Wood et al. (2007) have calculated a density surface of all geocoded Flickr photos and compared it with a density surface of population, producing a map that illustrates locations where there are more photos than would be expected for the local population density, and where there are fewer than expected. The map not only reveals spikes around tourist sites, but also unexplained highs and lows that might give clues to varying levels of participation in Web 2.0 sites such as Flickr. So far, a rigorous analysis of geocoded photo distribution as a result of the digital divide has yet to be performed. However, Muki Haklay, in a forthcoming article, has performed a similar analysis on OpenStreetMap data in England, comparing its spatial distribution with the government's indices of deprivation (Haklay 2008a, 2008b). His preliminary results show that OpenStreetMap activity is underrepresented in deprived areas. These studies are only beginning to show the extent to which activity in the world of neogeography is far from evenly distributed.

Cartographic Choices

As much as the technological capacity is crucial in opening up mapping to a wider variety of voices, it is, of course, the topics that are mapped and how they are represented that are critical in determining how space and place are perceived and constructed. Following feminist critiques of GIS discussed earlier, we recognize that different kinds of data, such as drawings, photographs, and interviews, can also have a powerful effect on how a map is received. As new types of data are introduced into mashups, they will have to be represented on the map in new ways.

In the first wave of Google-based mashups, the only icons available were Google's default pushpins, leading to mashups sometimes quite crowded with identical pointers, a syndrome known as "red dot fever" (Erle 2006). Visually and technically, HousingMaps, Chicago Crime and Scipionus all exemplify the early phase of web map mashups. At first Google Maps did not have the means to draw lines or polygons, meaning that only point data could be mapped, or data that could be forcibly transformed into points. This limited graphical message—a field of identical, interchangeable pushpins—could present a totalizing, alienating view, a problem that has

also been a critique of GIS and conventional cartography. Early mashups could be seen as even more abstracted and less nuanced than the dominant maps that they were meant as an alternative to. These crude ways of rendering data have improved significantly in the intervening years, with mashups today commonly making use of customized points, lines and polygons, as well as interactivity and links to photos, audio, video clips and external sites.

An example of this kind of multimedia mashup is the Tunisan Prison Map, well-known mashup by Sami Ben Gharbia of secret prisons in Tunisia.[17] This site further permutes our original definition of a mashup, in that it does not combine data from multiple sites, and while it does map stories from multiple people (similar to Scipionus), these stories are compiled and mapped by a single mapmaker. However, this site does operate like a mashup in the sense that different media are combined into one unified interface. Stories from former prisoners and their families are rendered on the map interactively as clickable texts, videos and links to other websites. This mashup begins to show how multiple voices and experiences might be incorporated into a map, attempting to represent the complexity of lived experience, while still locked into a 2-dimensional plane. Despite these advances in making maps better reflect the richness of human experience, it must be recognized that mashups remain a mediated experience. Even when they are annotated with interactive multimedia, photographs or text, mashups still retain the Euclidean framework of the map, presented in a bird's eye "view from nowhere." Mashups (and maps in general) cannot fully render the view from the body, and cannot account for the fact that everyone's view of a map (and the world) is inherently informed by their own subjectivity.

Also, mashups are no better than conventional maps in representing uncertainty in data. In this sense nearly all mashups severely violate the second requirement of GIS/2: that contradiction, inconsistencies and disputes should be preserved. Map mashups, especially the simpler early versions that display nothing but swarms of undecorated pushpins, can feed into the fallacy that by seeing the "raw data," the viewer is getting a less mediated view of the world. Mashups that consist of data feeds from other sources (like HousingMaps and Chicago Crime) are stripped of their metadata, thereby erasing any information about their positional accuracy or other data that might give the user an idea of what level of certainty to ascribe to each point. For mashups like Scipionus that are the product of a diverse set of voices, some level of contradiction can be

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[17] Tunisian Prison Map. http://www.kitab.nl/tunisianprisonersmap/

preserved in that multiple pushpins can be placed by different users, all representing their own opinion about a particular place; however, mashups do not deal with this gracefully, instead just piling each new pushpin on top of the rest, obscuring any points beneath.

Analytic Capabilies

A final difference between mashups and GIS is the apparent lack of tools for complex spatial analysis in GIS. As briefly discussed earlier in this chapter, neogeographers and mashup creators (two terms which are interchangeable for the present purpose) do not seem to need or want to perform complex analyses. In most cases, mashups and GIS are mutually complementary and, it could be argued, are best left to their respective specialties. Any mashup that is sufficiently like a GIS/2 would have difficulties incorporating anything but the most basic spatial analyses; data that includes contradiction and uncertainty is inherently resistant to quantitive analysis regardless of whether it is stored in a mashup or a GIS. Furthermore, Pavlovskaya (2006) points out that much of the "quantitative analysis" in GIS is not that quantitative, nor is there as much complicated analysis as we would like to think. However, even most common use cases of GIS, such as producing choropleth maps, are beyond the capabilities of most mashups. While it is too early to predict how common these types of tasks will become online, there have been some attempts at more advanced cartography using mashups, such as heatmap overlays available at GeoCommons.com. Others have used created thematic choropleth map overlays in KML that can be viewed in Google Earth and Google Maps. Even if mashups acquire more GIS-like features, the gap between amateur and expert skills will remain. Amateurs may be able to produce choropleth maps with mashups, but those amateurs may have no awareness of cartographic issues such as the Modifiable Areal Unit Problem (Fotheringham and Wong 1991) or the nuances of choosing an appropriate classification scheme. While the "death of cartography" (as a professionalized discipline) has been forecast since before the earliest days of GIS (Wood 2003), mashups may only further the spread of cartographic tools used without cartographic education.

Other nascent possibilities for combining mashups with spatial analysis lie in the further development of the Web 2.0 concept of web-based geocomputation services. In this model, servers perform geoprocessing tasks on data loaded over the internet, returning the results or re-

directing the output into another geoprocessing service, perhaps located on a completely different server in another part of the world. Servers could specialize in different tasks, or offer a complete suite of GIS operations for users who do not have GIS installed on their desktop computer. Also called "cloud computing", the shift of heavy computing tasks from the desktop onto the web not only allows the easy analysis of mashed datasets from all over the internet, but makes it possible to leverage the power of hundreds or thousands of computers for computationally intensive tasks. While cloud computing for geospatial data remains in the near future, it suggests a time when the functionality available in the mashup paradigm overtakes that of GIS. But as rigorous computation is applied to volunteered information, the absence of metadata and uncertain levels of accuracy within multiply-authored datasets will become acute concerns. The interface between the amateur and expert paradigms is likely to remain a difficult boundary to cross.

The arrival of cloud computing for geospatial data (already a reality in the case of web mail, online calendars, etc.) will provoke further questions for the increasingly networked citizen, such as: who pays for these online services? When all of my data is stored online, do I still control it? Do I own it? What privacy can I expect when my personal data is transmitted and copied dozens of times with each online request? Who gets to map my data? These questions that will recur again in the following chapters as we examine online maps of the political and the personal.

Chapter 4: Mashups, Counter-mapping and Control

Maps and Power

All maps are political, as we know from the work of Harley (2002), Wood (1992) and others. Maps embody the relations of power in a society. We have seen a long history of activists creating maps under the banner of "counter-mapping" or "critical cartography" to reveal hidden geographies and present alternative visions of the world, while artists have also used mapping to render personal and subjective geographies. The artist kanarinka, whose work engages with digital mapping and the experience of urban space on the body, writes "The practice of mapping is immediately political... Artistic choices are just like cartographic choices: they highlight one thing at the expense of an infinity of others. What is chosen constitutes a new world, a new life, a new society. This exercise of this power of invention is situated squarely within the realm of the political" (kanarinka 2006: 34).

Neogeography and mashups represent individuals taking the power to map into their own hands. This suggests a democratization of mapping, but does it change the political calculus? What are people choosing to map in their mashups, and for what purposes? What kind of cartographic choices are being made, and how might the technology of mashups guide the user's geographical expression in particular ways?

The following mashups all involve a political consideration, whether it is a critique of the structures of power within society, or an effort to understand and form communities with respect to a particular place. We must remember from Turner's definition of neogeography that, with some significant exceptions, neogeography is made by people for themselves. These mappings were created by the public to fill a need.

Advocacy Mashups

Among the best known examples of "advocacy mashups" (Ruiz 2007) used as a tool for community activism are a series of maps created by the website OnNYTurf.com, documenting the effects of large-scale development projects in New York City. Using a combination of maps and photographs, these mashups cover the construction of the new Yankee Stadium, the Atlantic Yards project in Brooklyn, and the development of the Williamsburg waterfront, also in Brook-

lyn. The Yankee Stadium mashup places particular emphasis on the loss of green space and the relocation of playgrounds further away from several schools. In 2006, OnNYTurf used the recently released Google Map tools to customize the "pushpin" icon, to create icons that display pop-up photos, and to overlay lines and polygons onto Google Maps, all creating a detailed cartographic argument against the new Yankee Stadium. Icons representing the widely-recognized yellow school crossing street signs were used to mark locations on the map where children would have to cross busy streets to reach the new playgrounds, red polygons were used to illustrate green spaces that would be converted to stadium parking, and clickable icons to show current photographs compared with renderings of the panorama after construction of the stadium. These before-and-after photographs were created using the software for modeling 3D buildings included with the Google Earth desktop software, and are employed in OnNYTurf's mashups of the Atlantic Yards and Williamsburg projects to contrast the towering height of the proposed construction with photographs of existing building facades.

The case of OnNYTurf's counter-mapping of development shows the possibilities of cartography in the hands of the community. By using maps to speak the language of planners and developers, community activists can confront development on its own terms. Now, using mashups, community counter-mappings are enhanced by multimedia interactivity and have a lower cost and wider reach through the internet rather than paper maps generated by a desktop GIS. Still, the case of OnNYTurf represents a single voice and vision of resistance, even while it may speak for a specific organization or community with thousands of members. When a single map is produced, regardless of its interactivity, it has passed through a selection process that reduces the information to a single perspective. Mashups such as those at OnNYTurf, HousingMaps, or Chicago Crime do not fully utilize the potential power of distributed knowledge and activity inherent in the web.

Later mashups followed in a similar political vein, but began leveraging the power of large numbers of distributed observations. In one mashup students in a University of Pennsylvania course have collected the locations of surveillance cameras near their campus,[18] a task that would be impossible for a single person to accomplish in any reasonable amount of time. Other mashups rely on collaboration to help their communities be more sustainable, as in

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[18] "Surveillance Cameras in University City, November 2006" http://www.communitywalk.com/map/19256/

FallenFruit.org where people share the locations of fruit trees in public spaces where ripe fruit would otherwise go to waste, or similar mashups such as SharingBackyards.com, meant to match up community members who are interested in maintaining an urban garden with those who have backyard space but not the time or skills to organize their own garden. I will discuss more mashups that facilitate the sharing of community information in the following chapter.

Some grassroots mashups have produced unexpected results when users repurpose to other ends, often to the surprise of the mashup creator or the organization providing the data underlying data. In one case, Greenpeace produced a mashup of locations of genetically modified farming in France. It used publicly available government data, as with Chicago Crime, and yet the simple act of mapping it becomes a political statement. In the case of the GMO map, the French government, despite being required to publish the locations of these farms by a European Union directive, forced the mashup to shutdown (Reuters 2006), leading Greenpeace to relocate it to web servers based in the Netherlands (Greenpeace International 2006).

In another case, a mashup of TV and movie filming locations in downtown Los Angeles was originally intended to help local residents avoid street closures and other inconveniences caused by film crews,[19] but during the 2007 Writers' Guild of America strike, it became a tool for picketers planning the location of their protests (Wortham 2007). Michael Frumin's fundrace.org from 2004 (Erle et al. 2005: 68) surprised many individuals by mapping the names and addresses of political campaign contributors. While this information has been publicly available for years, mapping it in such a vivid and interactive way has caused many people to rethink their expectations of spatial privacy (Olsen 2004). Other mashups like RottenNeighbor.com, a site where users can complaints about problematic neighbors linked to their exact location on a map, has provoked alarmed worries about manipulation of property values or even vigilantism (Barr 2008). Do social norms need to adjust to new technologies, or should certain kinds of mashups be prevented—and if so, how could that possibly be accomplished? To return to issues raised in chapter two, what kind of responsibility comes with the right of free speech, and similarly, what responsibility should come with access to sensitive data?

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[19] Downtown Filming Map. http://downtown-filming-maps.eecue.com/

Data Dependency

Most mashup authors take the stance that access to information is empowering, or, at least, that it is preferable over the uneven control of information, despite its sometimes unexpected or ambiguous results. Chicago Crime, for example, gives the public a cartographic representation of criminal (and police) activity previously only available to the police department itself. With this increased access to information, community members could make more informed decisions about safeguarding themselves from criminals, or equally from the police. In one sense, this puts the public on equal footing with the police: both groups have access to the same information. And yet, the flow of information remains unidirectional. The map does not include the perspectives of community members, and is completely reliant on crime as reported and therefore as seen by the police.

This reliance on one source of data leaves the community in a subordinate position to the provider of the data: the police. Clearly police forces have much more elaborate GIS infrastructures, which, in many cases, take center stage as a new management paradigm for policing, as in New York City's COMPSTAT system, developed in the 1990s under Mayor Guiliani and since copied by police departments world-wide (Moore 2003). Like the Chicago Crime mashup, COMPSTAT's technology entirely depends on the perspectives and accuracy of police reporting, which has unfortunately resulted in abuses committed by NYPD precinct commanders who deliberately suppressed the reporting of crimes (Treves 2006).

The analysis of a situation depends on the available data, and even "good" data doesn't ensure a good analysis. Limitations on data sources tend to lead people to only perform analyses on data that are easily available. A corollary of this problem is that people will tend only to do computer analysis with the types of data that can be represented in a computer. This is true with the specific geometric data types available in GIS, and is even more acute in the more limited set of data types first available in mashups. Early mashups have shown that instead of improving upon this problem of GIS, they may be even more susceptible to it. Given the relative dearth of accessible and intuitive tools for creating geographical information, most early mashups tended to follow the paradigm of HousingMaps and Chicago Crime, simply plotting data points from another source on a map. This lead to mashup authors simply looking for interesting things on

the web that could be mapped as points, or creating their own point data sets, rather than thinking of other types of data that they would prefer to map.

As alternatives, Chicago Crime could leverage the inherent advantages that local community organizations have, specifically regarding their communication networks, to expand the reporting of crimes and to include more voices for a fuller assessment of crime in the city. For instance, Chicago Crime does not include community-reported crimes (nor reports of excessive police use of force), which could be used to counter any skewed police department data. Mashups could easily accept user-submitted data and would give community members a larger stake in crime prevention and reporting. They would not, however, radically recast community relations since they, like GIS and paper-based mapping, play only a small role in the larger processes of community organization and activism.

Even when citizens do participate in creating data, as in the community sites listed in the previous section, the promise of easy sharing and interoperability is still far from becoming reality, and it is generally quite difficult for mashups to be further repurposed as parts of other mashups. This results in significant duplication of effort. For example, a search of ProgrammableWeb.com returns at least five separate user-created map mashups representing an interactive New York subway map.[20]

Similarly, dozens of mapping mashups were created during the Southern California fires of 2007. Unlike the Scipionus mashup that gathered messages from Hurricane Katrina victims in one spot (but which, however, did not attempt to be a clearing-house of other sources of information about the Hurricane), these fire mashups tended to duplicate the same kinds information on multiple sites, meaning that if someone was looking for messages about a particular area (for example, an evacuee looking for reports from other residents on their street) they might have to search several different mashups to find the information.

In the case of the New York subway mashups, this diversity of voices and representations could be beneficial, assuring that no one individual has a monopoly on information that is useful to the public good, and encouraging competition between mashups to provide better service. On the other hand, little culture of building on each other's maps has developed, leaving mashup authors as an archipelago of solitary geographic voices. The problem is partially technical, in

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[20] Mashups containing their own data representation of the NYC subway: bogozo.com, gypsymaps.com, www.brail.org/transit/nycgoogle.html, nycsubway.eyebeamresearch.org, www.onnyturf.com/subway.

that extra work is required to create a mashup that then in turn produces an RSS feed suitable for input into another's mashup. Secondly, the ability to search for spatial information across multiple sites remains a challenging problem on the Geoweb, although Google's search engine has begun spatially indexing sites containing data in Google's KML format and including those results in its search engine. They problem is also partly social; Goodchild speculates that one of the main factors that drives user generated content is the self-promotion resulting from having one's name associated with it (Goodchild 2007a). Given the uneven adoption of attribution licenses such as Creative Commons and limited ability for a mashup to show attribution for its mashed data sources, the only way to guarantee credit for a mashup it to host it on your own site.

This problem of attribution can also work to produce unequal voices in distributing information. We are seeing, in geography just as in the media, that those in power can set the terms of the debate by releasing certain information in certain ways. The Chicago Police Department, by releasing an easily mashed-up feed of crime reports, solidifies itself and its representation of the facts as the canonical source. Even if others were to create a version of the Chicago Crime mashup that provided non-police accounts of events, its voice could easily be lost in the cacophony of the web, when compared with data attributed to a well-known source.

"Open" Code

Another growing trend involves governments offloading services onto Google. A prime example is Google Transit, where transit agencies provide their routes and schedules to Google, who integrates the schedule information into their online map directions tool. From the agencies' point of view, they no longer have to spend money to maintain their own trip planner websites or maps, if Google will do it for free. For the transit rider, the user experience of Google Transit is far superior to anything a government agency could afford to provide, although there remains the potential that these transit directions could become a conduit for online advertising by Google. Advertising revenue (either immediately generated, or predicted in the future based on a user-based developed during a loss-leader period of free services with no adversing) is the fundamental reason for Google to provide so many free services to individuals and, in the case of Google Transit, government agencies. A newspaper article interviewing Google Local product manager Bret Taylor about the significance of Google's "open code" puts it this way: "Google

recognized while developing the mapping feature that it would not have the time or the desire to create a host of special interest maps. Yet having numerous mash-ups would serve Google's strategy of becoming the ubiquitous organizer of the world's information - hence its openness. [...] (In fact, in exchange for allowing use of the maps, Google reserves the right to run ads on the sites in the future.) 'It's great for the developer and it's great for Google,' Mr. Taylor said" (Darlin 2005).

Here we see that Google's "open code" is only open in specific, limited ways. Transit agencies provide their data to Google in the Google Transit Feed Specification (GTFS), [21] which is "open" only in the sense that the file format itself is freely available, so that anyone can create files in that format, or decode files, if they happened to get their hands on one. GTFS is not an open standard in the sense that its development is not managed by an independent body. Nor is there any requirement that the transit data itself is available openly under the GTFS. Users can only access the transit data through Google's web interface, and cannot download the entire data-set themselves for the purpose of performing their own analyses with the data or providing their own web service using the data (thereby avoiding any future advertisements, perhaps). Some transit agencies have taken the initiative to voluntarily publish their GTFS data publicly, but many have not, providing it exclusively to Google.

O'Reilly's new Web 2.0 paradigm of interoperability and interconnected services remains far from full materialization; most websites and data providers are not willing to cede so much control to users, as they lose precious web traffic and concomitant ad revenue as a result. Moreover, HousingMaps is curiously lauded as a service that everyone wants and needs, a killer-app as it were, and yet craigslist fails to incorporate its mashup into its own service. Since craigslist is currently a free classifieds program it may sidestep the pressures of the market, but as an innovation in web based data sharing, it is surprising that it has not brought HousingMaps into its digital fold. Perhaps if craigslist were a fee-based service, HousingMaps would be quickly absorbed and re-purposed for corporate interests. In this context, it is important to focus on the potential of mashups to create mappings that remain out of market reach. In particular,

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[21] Google Transit Feed Specification. http://code.google.com/transit/spec/transit_feed_specification.html

what kinds of mashups can be created to address issues and perspectives of interest to society and specific communities?[22]

Marketing Social Mashups

The increase of "neogeographical" data online (such as maps of favorite places, the locations of friends in a social network, the positions of geocoded personal photos) raises questions about privacy and an individual's control over representations of their personal information. On the one hand, some decrease in privacy must come part and parcel with sharing information with friends, and for the most part (although this is rapidly changing in a variety of ways) the people who are releasing this private spatial data are doing it voluntarily and are, presumably, satisfied with the digital enhancement to their social lives that comes in the bargain. On the other hand, these trends represent a shift toward mashups that may be less democratic and less focussed on satisfying the requirements of the user. This shift is occurring in two ways: First, the search engine companies that host these social networking databases will always be in a better position to develop in-house mashups, when compared to an outside mashup author who must interface with public APIs that are less efficient (and have less functionality) than dealing with the database directly. Secondly, these in-house mashups will be able to set the terms of the future social evolution of the mashup ecosystem, guiding the most popular social mashups in directions that may be more beneficial to corporate profits than the user's needs.

One example of this trend is TagMaps[23], a mashup that searches through the descriptive tags on public geocoded Flickr photos, grouping clusters of similar tags rendered on a map. TagMaps gives a fascinating visualization of the folksonomies used to define places and express feelings associated with place; the cartographic implications of which will be discussed in the next chapter. Crucially, however, this technology was developed not among the mashup community, but from within Yahoo!'s research department. While the ideas leading to TagMaps were freely circulating, it was Yahoo!'s extensive Research and Development budget (and, inevitably,

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[22] Chicago Crime is another case of a mashup that has not tried to monetize its user base. The site has seen a change towards towards "professionalization", but it has remained ad-free, thanks to a grant from the Knight Foundation, a non-profit foundation associated with the Knight-Ridder newspaper conglomerate. Few other mashups are high-profile enough or devoted to a public service in such a way to be eligible for this route of funding.

[23] TagMaps. http://tagmaps.research.yahoo.com/

their intimate knowledge of their own software's capabilities) that helped Yahoo! beat the community to the punch.

It must be noted that these web mapping companies are constantly innovating, struggling to create new, more appealing tools for mashup authors, but also working to make the best use of their own internal technologies and data sources. The search engine companies are pursuing a practice of internal mashups, with heavy funding and preferential access to services and data. Google, in particular, is famous for its "20 percent time" policy, where its developers are allowed one day a week to work on any project of their own desiring. Google sees this as a research investment, as many of these 20 percent time projects have later become successful and high profile parts of Google's stable of services. This further calls into question the perception of mashups as an "outsider" practice, revealing that they are strongly encouraged by web mapping companies, both internally and externally, and form an important component in their profit-making plans.

In this context, we must ask: What is the emancipatory potential of mashing your social network, especially considering how many corporations would love to have your social network in an electronic format? It is inevitable that TagMaps and similar data mining techniques will be applied to locative marketing, perhaps explaining Yahoo!'s eagerness to be on the cutting edge of the technology. Before the advent of the Web, marketers had to make crude aggregate predictions based on zip codes (Goss 1995), but now many users of social mashups are voluntarily publishing their interests, friends, location, and even their daily movements and activities, becoming ideal targets for direct marketing. Some of the features of recently developed social networking mashups, such as being able to share your location in real-time with a network of friends, have been preceded by propriety versions by mobile phone providers. In a series of TV commercials targeted at the young urban demographic, Boost Mobile advertised the ability to maps your friends' locations on your mobile phone. In the commercial, a group of friends (each one highly rotund, in the shape of a geocoded point on a map) repeatedly call one another to ask the question "where you at?", a playfully redundant question, in that they can all instantly tell where their friends are on the maps embedded in their phones. In real life, of course, each playfully redundant phone call adds to Boost Mobile's profits. As is becoming increasingly evident, our private social relationships mean big money for corporations eager to help us digitize them.

Pipes and Mapplets

The competition for "mashup market share" between the big web mapping sites also extended to competing data formats. Google expanded its KML file format, originally specific to Google Earth, into an all-purpose geodata format, mappable in mashups based on Google Maps as well. This expansion of KML was part of Google's attempt to use it's dominant position to make KML into the de facto standard for geospatial data in mashups. Meanwhile, Yahoo and Microsoft, as relative underdogs in the field, leaned toward the open standard of GeoRSS as a way to compete. In April of 2008, KML was accepted as an Open Geospatial Consortium standard (Shankland 2008), ending ending Google's *de jure* control, but only after KML had solidified its position as the dominant file format for geospatial data online.

This jockeying over data formats also reflected a conceptual split between Google's focus on data and Yahoo's focus on tools for sharing and combining data. These different approaches have been reflected by the systems set up by the web map providers to encourage more mashups to move onto their own servers. Early 2007 was marked by two major developments towards these ends: Yahoo!'s Pipes service[24] and Google's Mapplets.[25] Pipes and Mapplets both represent attempts by Yahoo! and Google to make mashups easier, and to continue to keep as much mashup functionality as possible dependent on their servers and their technologies. Yahoo! and Google' diverging approaches are clearly evident: Pipes is a toolkit aimed at simplifying all kinds of mashup programming, while Mapplets is a graphical interface for drawing points, lines and shapes directly onto a map. Pipes focuses on the paradigm of remixing existing data, while Mapplets focuses on the creation of data.[26]

In any analysis of a new technological paradigm, we must be careful to acknowledge the technology and the culture, neither assuming that one determines the other (Chrisman 2005), or to follow the fallacy that they can be considered separately. Throughout the history of mashups, we have seen advancements in mashup technology and mashup practice constantly leapfrogging one another, feeding off the strengths and weaknesses of each previous iteration, and progressing

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[24] Yahoo! Pipes, http://pipes.yahoo.com

[25] Google Mapplets, http://code.google.com/apis/maps/documentation/mapplets/

[26] Following Mapplets, Google continued releasing tools to facilitate both the creation of data *and* the development of mashup functionality. For example, Google Mashup Editor is a direct competitor to Yahoo! Pipes.

in a reinforcing cycle. The twin developments of Yahoo!'s Pipes and Google's Mapplets may create a fork in the mashup movement, or they may represent different points on the technology-culture cycle, each responding to different demands from the community of mashup authors, and each nudging the development of the culture in different ways.

If we must consider the two technologies as dual gambits competing for control of the same community, Google's Mapplets possesses a more intuitive user interface, targeting users who have relatively simple requirements in a mashup. Here we may find more user experimentation with respect to subjective, personal cartographies, and more games with the perception and interpretation of maps. In this sense, Mapplets are targeted more at the original sense of neo-geography as defined by Platial. With Pipes, on the other hand, we see that even its name privileges the technology over culture. And yet, for purposes of emancipation, or understanding and critiquing power structures, is it not the "pipes" of society that must be understood, the substructural relationships that pump power and influence throughout the system? Pipes is the closer heir to the narrow definition of mashups, a tool for reworking and reconnecting parts of the digital landscape

Tim O'Reilly, in discussing the implications of Yahoo! Pipes, draws our attention to something he wrote in 1993: "It has been said that Unix is not an operating system as much as it is a way of thinking. In *The UNIX Programming Environment*, Kernighan and Pike write that at the heart of the Unix philosophy 'is the idea that the power of a system comes more from the relationships among programs than from the programs themselves'" (Peek et al. 1993: 4). These statements were made before the development of the web, but were informed by intimate knowledge of the internet and of UNIX: the shifting and hidden armature of computer networks that still provides the plumbing for most web activity, even today. Equally fascinating is the fact that the statement about power and relationships could be easily paraphrased into the language of any contemporary geographer. While it is unlikely that UNIX will provide much of a model for the future of the web, as O'Reilly may hope, we have seen in development of mashups that the power of the system is indeed not in the programs but in the relationships, in relationships of data, of authorship, of web services, and of daily social experience. Given that mashups, taken in their essential form, are composed of nothing more than relationships, they may be the ideal window into the workings of the plumbing of the web, and, increasingly, of society.

In the year since the announcement of Pipes, however, its repercussions have not been widely felt. Ultimately, people who are "unix inclined" may still write their own code directly. While UNIX itself is powerful and represents the "plumbing" that runs most of the internet behind the scenes, it doesn't really enter into most people's daily lives. What may be be the most interesting aspect of Pipes is that projects developed in Pipes can very easily be shared with others, allowing them to edit and improve upon the project. In this sense, Pipes could facilitate the first *open source* mashups.

As we have seen, no mashup is free from dependencies on external data sources, software and other infrastructure. But perhaps this was to be expected. There is only one internet, and mashups cannot exist outside it. At best, mashup authors can be aware of the dependencies of their creations, and attempt to make mashups that actively identify their sources and their limitations.

Chapter 5: Mashups, Maps and Tracings

Mapping the Personal

Matt Haughey's Memory Map[27] is an early example of local knowledge mashed onto a Google Map. Memory maps involve users carefully annotating the satellite images of a particular place, using photos and textual narratives, often poignantly relating stories from their past. While the look of this map is a precursor to sites like Wikimapia[28] that attempt to mark places that are of interest to anyone, these memory maps contain annotations that are meaningful only to a very small group of people. The tags are also meant to be read together in a kind of non-linear narrative, rather than as discrete points of information, forming an interconnected continuous mental map rendered directly onto an aerial image.

The inclusion of aerial photography in the major web mapping services has further increased the significance of mashups as a kind of proxy for real-world locations. Panning over the aerial photography in Google Maps or Google Earth in a kind of God-like flight has become an experience in and of itself. Google Earth fetishizes the realistic appearance of the earth's surface. As an analysis tool, aerial imagery rarely adds more context than a conventional map could, but on an emotional level, it resonates, as people zoom into the satellite photos of their house, their school, where they grew up, and other personally meaningful locations.

While the novelty of high-resolution aerial imagery was the impetus for Haughey's Memory Map, the drive to map personal and emotional geographies has a much older history. Some of these precursors are specifically mentioned in Eisnor's definition of neogeography. Continuing on from her definition quoted in chapter three, she positions the mashup-hosting website Platial.com (of which she is co-founder) in a historical trajectory that long precedes online mapping:

> Platial, however, is just one example of a broad field of activity that includes urban exploration, site specific sculpture, land/earth art, geo-tagging, guided walks, ephemeral cities, imaginary urbanism, altered maps/radical cartography, travel writing, psychogeography, place based photo blogging, etc. What connects all of these activities? There may not be a clear

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[27] "My childhood, seen by Google Maps." http://www.flickr.com/photos/mathowie/8496262/.

[28] http://wikimapia.org/

> answer, but we would say they all comprise, or fall under the rubric of, neogeography (Eisnor 2006).

Whatever definition of neogeography we choose, memory maps clearly fall within it. These "spatial stories" or "mapumentaries" (to use two other terms popularized by Platial) present a map-based narrative, but often not a linear one, letting the reader drift from experience to experience as they navigate the map. Returning to the origins of "neogeography" we find it is seen by some as a word to replace or complement "psychogeography", a term originally used by the Situationists (Crampton and Krygier 2006), but one that had been used increasingly on the web to describe user-created maps of meaningful locations. Some neogeographers share with the Situationists the suspicion of canonical maps as inscribers of power relations, and the belief that the ability to make maps should be in the hands of everyone. The Situationists also believed in a different approach to experiencing and representing geography, emphasizing personal, undirected interaction with the city. While personal mapping like memory maps could be seen to follow this directive, it is debatable whether narrowly-defined mashups offer a truly different approach. Instead of encountering the unexpected, some mashups present only the dataset requested, which, even if it is dynamically updated such as the feeds used in HousingMaps or Chicago Crime, may not produce surprising or unexpected results. Sites such as Flickr Maps provide more opportunities for the unexpected, as the user is not browsing based on keywords or any other factor that would produce expected results, but rather is browsing based purely on geography, allowing for fortuitous collisions and discoveries analogous to the real-world Situationist *dérive*.

Guy Debord, perhaps the best known member of the Situationists, wrote several well-known, if oblique, works about the urban experience in an age of consumer spectacle. Debord popularized the term psychogeography, which he defined as "the study of the precise laws and specific effects of the geographical environment, consciously organized or not, on the emotions and behavior of individuals" (Debord 1955). The primary methods of investigating the psychogeography of a city were *dérives*—a form of wandering in the city without destination as described above, drifting according to an individual's immediate feelings about which direction seemed more or less inviting—and *psychogeographic maps*—a "renovated cartography" nominally based on observations made during his experiences of the *dérive* that took the form of a

collage of cut-up pieces of conventional city maps with arrows rendering the psychogeographic flows between neighborhoods.

The *dérive* and the psychogeographic map can be understood in the context of Debord's theory of the Society of the Spectacle (1967), where he argues that the capitalist agenda of consumerism has made people into passive spectators, regimenting their daily lives and channeling all experience through the spectacle of mass media and the accumulation of commodities. Through the *dérive*, people would experience the world in an unmediated way; the *dérive* also facilitates a break in their quotidian habits, disrupting the urban script as they set aside their planned, expected behavior and intrude into unfamiliar spaces and social settings. Psychogeographic maps were an example of *détournement*, the Situationists' theory of artistic production through the process of appropriating and recombining parts of existing media in order to undermine or reverse its intended meaning. As such, these maps are less important as documents of psychogeographic terrain, and are primarily meant as interventions in the way space is represented, to shake up the way people interact with and think about space. Here we can return to Paul D. Miller's link between sampling and the *dérive* (briefly addressed in chapter two), only in this case establishing a link between *détournement* and mashing, between psychogeographic maps and mapping mashups. However, von Busch and Palmås (2006) point out that *détournement* operates through devalorizing the object of its critique; mapping mashups, particularly those concerned with personal experiences, do anything but.

Tags and Mashups

Geocoding and geotagging have made it increasingly easier to for users to create geospatial information, and has automated the processing of adding location information to existing data online. One popular example of the ease of geocoding spreading to large numbers of people is the success of geocoded photo sharing sites. The most popular example is Flickr, and throughout 2006 a number of mashups developed that would scan public photos on Flickr and extract any geocoding information that the photographer had embedded in the image file. Seeing the growing appeal of these mashups, Flickr itself added features allowing users to easily geotag their own photos: upon uploading, users can click on a map to identify where the photo was taken, and those geographic coordinates would be embedded in each image file. Not long after,

Flickr incorporated a map-based photo browser into their own site, making obsolete all the other mashups that had been feeding off of it.

Using the map it is possible to browse literally millions of geocoded Flickr photos around the world. Panning across a city, the user sees hundreds of clickable dots, each one representing a collection of photos taken at that spot. The pictures might be impressionistic or literal, landscapes or indoor scenes, pictures of public places or of groups of friends in private. This mixture of public and private gives a strong sense of the lived-in terrain in the city, a sense that is absent in the homogenized network of lines on a typical street map. The photos are multitudinous, at once reflecting a sense of how the city might look on the ground, while also suggesting the impossibility of coming to a singular view, one map of the city that reflects all its inhabitants.

As social relations begin to populate these virtual worlds through mashups, new social geographies of information are being produced. The rich metadata of descriptive textual tags and narrative comments linked to each Flickr photo now present an immense digital resource of people's experiences, impressions, and interpretations of time and place on the earth's surface. One recent attempt to explore the possibilities of this corpus of information is 2007's TagMaps, (mentioned in the previous chapter), a site that extracts tags from geocoded Flickr photos and draws them directly on a map at each photo's location. By grouping similar nearby tags, a TagMap renders an undulating surface of geographic text, providing a way of exploring the collective impressions and annotations of the entire population of Flickr users.

The first TagMap example demonstrated that the names and locations of neighborhoods could be identified, with no information or prior knowledge other than the locations and associated tags of all the photos in Flickr. A second example tries to locate neighborhoods with an active nightlife by selectively mapping photos with a time stamp showing they were taken at night. Flickr photos are just the beginning; this approach can be applied to more than photos, and devoted to folksonomies more complex than the names of neighborhoods. Technologies such as TagMaps are beginning to explore and map social networks and to study the rich sources of non-hierarchical, distributed knowledge and experience now becoming available on the internet. Technologies like TagMaps appear to herald a kind of nascent community knowledge network, where machine-based aggregation and analysis of user-provided information people could learn from the experiences of others, obviating the need for guidance from authoritative sources. But as has been mentioned earlier, this mapping of social information can also be used for purposes

such as advertising, surveillance, or other similar purposes that may or may not be in the interests of the people who are creating producing the tagged information.

With the geocoding of blogs and other forms of messaging, mashups are coming into closer synch with the temporal rhythm of daily activity. The prime example of this process is Twitter, a service for broadcasting brief messages to a network of friends or to the public. These messages, known as "tweets," are individually no more than one or two lines of text, and as such tend toward the quotidian and self-indulgent. Occupying a social space somewhere between blogs and SMS messages, Twitter has been described as "microblogging," and represents another technology that owes its success to an extremely low barrier to entry. The low cost (in terms of time and effort) of writing a tweet leads to a much larger database of messages and more raw material for Twitter-based mashups.

As with the early days of Flickr, competing mashups of Twitter exist, using extensions of the locative technologies currently available in blogs. It is possible to search for bloggers or blog posts within certain proximity of your location, and now possible to map Twitters nearby, too. Soon, however, by combining mobile phone-based tweeting with GPS phones, it will be possible to have each user's tweets geocoded at the point where they sent the tweet, not just where they live. Some commentators point out that Twitter's success does not come simply from the idea of microblogging, but because it straddles so many formats of communication, seamlessly bridging Instant Messaging, SMS messages, email, blogs and so on. Hence, Twitter's most important legacy may prove to be its flexibility and interoperability, coming closer to the ideal of Web 2.0 than any application so far.

Technologies like Twitter are just one part of the sea of countless geocoded messages—both those created actively and those that occur passively as traces of daily life online—that ultimately forms a digital text of our lives, recorded in space and time.

Data Shadows and Digital Archives

These traces might have been read by Debord as a psychogeographic text, giving insight into the psychological contours of space. But perhaps they might be better interpreted through Michel de Certeau, another writer who explores the significance of how space is experienced. De Certeau (1998) describes the experience of viewing New York from the top of the World

Trade Center in 1980, looking down on the silent, unreadable crowds. These "ordinary practitioners of the city live 'down below,' below the thresholds at which visibility begins. ... [T]hey are walkers, *Wandersmänner*, whose bodies follow the thicks and thins of an urban "text" they write without being able to read it" (de Certeau 1998: 98). We can attempt to read the urban text by going up in a skyscraper (or looking at a map), but inevitably this image is a simplified one—we can no longer see the contingent, situated actions of individuals that determine this text, nor, from this arms-length view, can we participate in writing it. We cannot see the urban text and be in it at the same time, but in neither position, according to de Certeau, can we truly read it.

The advent of mobile communications and locative technologies has complicated this state of affairs. The urban text has, in its digital form, become much more literal. With mobile locative media, the individual can communicate with and share in the experiences of others anywhere in the city. Individuals can be tracked and track others, seeing their own position and activities in the context of thousands of others. It remains to be seen what it means to digitally read the urban text, and how, if at all, these advances change the way it is written.

De Certeau is much more pessimistic that Debord when it comes to the possibility of escape from structures of control, although he does recognize that personal forms of resistance and agency can exist within the confines this domination. De Certeau adapts terms from military history to define two classes of actions or relations: the strategic and the tactical. Strategic actions control physical or social space; they depend on this space and project from it, but can also be separated or abstracted from it. Tactical actions operate purely within the network of relations; they are inherently embedded in it, and do not control any physical or social space. Tactics are opportunistic, temporarily overturning power relations when the possibility arises, but each success is fleeting, and must always be recreated anew.

Daily life is tactical. It is a process of making do with the situations at hand, of imaginative reinterpretations, of "tricks, getting away with things, cunning" (de Certeau 1998: xix). The act of *détournement* from Debord could be considered to be tactical: it is a tool of the weak against the powerful, deflecting and reinterpreting the products of the dominant system. *Détournement* controls no territory, it creates nothing itself, it only remakes what has already been produced. Furthermore, it does not confront power in the oppositional position of an equal; rather, *détournement* operates within the network of power, destabilizing it, turning it against itself. However, the theories of Debord and de Certeau diverge when it comes to the resulting ef-

fects of these actions. De Certeau sees tactics as momentary and fleeting, while Debord believes that a *détournement* can last, that it can be shared with others and influence them, and that it can build upon other works and create a lasting destabilization of the system, even the creation of a new regime.

In the contemporary digital world each action in digital space leaves a trace, and each trace can be followed (reversed) back to its origin. In this way, the recorded trace of daily life can be easily turned and used strategically by systems of surveillance and control (for example, the monitoring of an individual's location through cell phone records or credit card purchases) (Dodge and Kitchin 2005). Information will be a two-way flow: while we can expect to see increasingly precise navigation and services provided to the consumer, along with increasingly pervasive location-based advertising (Holmes 2006, Zook and Graham 2007), at the same time information about the consumer's location and habits will be collected and analyzed by corporations and governments. GPS is a one-way technology—when navigating using a GPS receiver no one can tell where you are, or even whether your unit is turned on or off—but when combined with phones and wifi, that information will be difficult to keep private. Even the cruder technique of calculating a cellphone subscriber's location based on which cellular towers their phone is in connection with—accurate only to hundreds of meters—is now playing a prominent role in many court cases, with police demanding access to records from mobile phone companies to determine where a suspect (or, at least, the suspect's cellphone) was at the time of a crime. In this sense, we cast a "long data shadow," to use Matthew Zook's image (Zook et al. 2004). And like a shadow, this digital trace is becoming impossible to shake. Even if someone tries to opt out from these technologies, they will still leave a trace through their relations to others, and can even be accused of suspicious activity by choosing not to be tracked. In July of 2007 police in Germany arrested a professor for attending a meeting of anti-capitalist arsonists, including among their evidence the fact that the professor had suspiciously left his mobile phone at home during the time of the meeting, therefore making it impossible to track his movements during that time (Sennett and Sassen 2007). When consensual surveillance becomes pervasive, the things one chooses to conceal leave a clearly visible gap in the fabric of data, inverting the idea of the data shadow from a bright digital trace to an equally trackable void.

The digital panoptic archive is a fact of contemporary wired existence. This "archive" is not a unified, library-like vault controlled by a single dominating power, but rather an overlap-

ping mesh of various digital traces and records, stored by various government or corporate bodies but increasingly interconnected. The ensemble of these various databases represents a system of viewing and documenting any given action through numerous political, economic, and social angles. But even within this unescapable database of traces and digital footsteps, individuals still have the same agency to decide what kind of mark they make in this archive as they do to decide what kind of actions they make in the real world. Instead of thinking of this digital archive as a new, more complete form of paper documentation, totalizing and static, we might recognize it as a space that is open, multilayered, and ultimately co-created.

When Matt Haughey made his Memory Map, populating space with phrases like "there used to be a huge orange grove here" or "here I almost got hit by a car when I chased an ice cream truck," he is taking control over what information enters the digital archive; he is choosing how to populate it. These snippets of literal text (not metaphoric "urban text") bring the full complexity of human language (and all its strengths and weakness) into the map, foregrounding the richness and multiplicity of the many voices of the city, while also risking particularizing the experiences in ways that could exclude others or fix the meaning of a place. The map becomes dependent on the text, thus creating another layer of representation. In the end, these annotations—subjective, aleatory, overlapping, even contradictory—produce a portrait of the city that is perhaps more diverse, nuanced, and lived than the points on the map themselves.

Collaborative Mashups

Memory maps could also be seen as a kind of "humanistic cartography" as described by Monmonier (2007), or a distant cousin to Sui's humanistic GIS (2004). These humanistic mappings are composed of subjective, personal observations organized towards no coherent purpose. This differs slightly from the concept of GIS/2, with its goal of supporting a community in the course of some kind of organized action. Humanistic cartography also differs somewhat from the psychogeography of the Situationists, which, although it also attempts to reflect the emotional, felt experience of geography, is also directed towards a purpose, that of challenging and up-ending the dominant uses and interpretations of space. The humanistic, idiosyncratic field of memory maps and similar mashups do not have a unitary purpose; they reflect the everyday, the

irrelevant, the absurd, and are directed toward as many different ends as there are readers and writers of these data.

The website Platial.com, mentioned earlier, provides a framework for creating similar maps, and introduces the possibility of collaboration between these diverse voices. Platial is only one of several web sites offering similar services, but it is one of the most popular. Flipping through the various maps of an area, we see overlays representing how particular individuals or communities perceive the city. In one example, someone mapping abandoned spaces points out a prime location for picking blackberries, while in another map a user has created a virtual tour of forgotten locations in Portland's "radical history". In a third, we see a map of skateboard spots in Portland. When the user highlights a point, she sees that other users have added their own comments and experiences to the map. This is an online social network, but instead of sharing information with users all over the world in the non-space of the internet, they are sharing local knowledge about real places. Instead of a fragmentation of society into small groups of increasingly narrow interests, the geospatial web may have the potential to reground communities of interest back into geographical space, augmenting a sense of local community rather than replacing it.

With the possibility of inclusion, however, comes the potential for exclusion as well. These memory maps and Platial's social mashups are just as political as the mashups discussed in earlier chapters, such as Chicago Crime's mapping of criminal activity or the L.A. filming mashup that was repurposed to support organized labor action. While the those mashups made political arguments by presenting existing data, these personal and social mashups make political statements by creating data. These are not maps aimed at everyone, but at other members of the community. In the choices of what is mapped and what is not, these collaborative mappings stake out the boundaries of a community: they mark who is in and who is out, and claim which psychogeographic places are theirs, despite which other communities may share those places in geographic space.

The formation of strong spatial communities online faces some challenges, however. Goodman and Moed (2006) argue that there are some particular qualities that make for successful digital communities, specifically that users have control over their self-representation, that the software and data are persistent and stable, and that the boundaries of the communities themselves can be made stable and visible. All of these goals all appear to run counter to the natural

structure of mashups. In particular the possibility of data being remixed or presented in unexpected contexts gives pause to community members sharing some of the personal information that would normally help strengthen social relationships. The introduction of the geographic component further changed the way users thought about public and private information in Goodman and Moed's study. In this sense, just as communities forming in mashup-based sites like Platial are marking out territory, they are also opening up themselves to varying levels of scrutiny as determined by the current and future design of the site's software.

Soon these online disclosures of personal information will also begin to seep back into physical space. Combined with mobile devices such as cellphones and portable computers, virtual space and physical space become intimately intertwined, making it increasingly routine to access and edit cyberspace while moving through physical space. As William Mitchell writes, "Contrary to once-popular expectation... ubiquitous digital networking has not simply ironed out the differences among places [...] Instead, it has provided a mechanism for the continual injection of useful information into contexts where it was once inaccessible, and where it adds a new layer of meaning" (2005: 18). These digital layers of information will be increasingly co-created by the people inhabiting these places. This might remedy the problems of having a single voice attempting to speak for a community, as in some of the earlier mashups and in many attempts at counter-mappings. However, Mitchell's use of accessibility should remind us that despite the user-friendliness of Platial's interface and seemingly ubiquitous networking, the digital divide remains a huge concern, especially for many of the disadvantaged communities who might benefit most from new kinds of mapping. Just as many mashups represent data with identical pushpins, Web 2.0 in general assumes a public of autonomous, equally-skilled individuals, with equal opportunity to participate.

Despite these problems, Platial illustrates how mashups have the potential to change and evolve continuously, especially those that are collaboratively created and edited. Maps need not be static images, particularly in the era of the web. When we discuss Web 2.0 and wikis, we often focus too much on the fact that they are user generated and neglect that they are constantly under-construction, always provisional stabs at understanding a subject, never a final draft. Partly this is a necessity of their collaborative nature, but it is equally a result of their existence in the digital realm. Mashups can be easily written by anyone, and just as easily rewritten. They are always in process, provisional, speculative.

Maps and Tracings

De Certeau (1998: 120) argues that maps evolved to push aside the marks of their creation, the evidence of the necessary lived experience of mapping and moving through space . Early maps were little more than illustrated, annotated travelogues documenting the route from one place to another. As maps incorporated more information and covered more terrain, they also became more autonomous, shifting to a bird's-eye-view and removing the author's commentary—annotations of travel times, drawings of places as seen on foot, etc.—in favor of a totalized plane projection of space. These texts and illustrations were also pushed aside as the map "colonized" pictorial space in parallel with European colonization of real world space, gradually filling in the empty spaces, replacing drawings of ships (and sea monsters) with newly "discovered" lands or the utilitarian Mercator graticule of latitude and longitude lines. De Certeau links these two forces—the increasing autonomy of representation and the filling-in of the planar map—as a unified cause in the excision of stories, experiences and individual voices from modern cartography. While this change was clearly driven largely by the rational scientific ideology of European modernism, the practice of cartography has also been hemmed in and codetermined by the techniques of representation available—namely, that of the static, paper-based (or parchment, or vellum) two-dimensional map.

Now that the map has been separated from its paper body, in the form of a dynamic, mutable digital version of itself, is it now possible to break out of the historical trajectory de Certeau identifies? Given clickable pop-up windows, user-selectable layers, and interactive zooming, the marks of the map's creation are returning to the map, co-existing as another layer on top of web-based maps. In this way, the emphasis returns to the practice of mapping and away from from the final product of the map; the mashup becomes more than points on a map, it becomes a collection a textual stories situated in space. These annotations are most productive when they stimulate further annotations, provoke new networks and relationships between people, and contribute to the creative construction of the meaning of a place. In this sense, these annotated placemarks are more than just a return of personal stories to the map; instead, they may be the beginning of spatial conversations. These are conversations not only about the place itself, but also, on the meta level, about the annotation of the place, as comments build collaboratively

upon comments. Thus the process of negotiation that takes place in mapping becomes explicit and self-reflexive, returning the marks of the author to the map, as in de Certeau's pre-colonial mode of cartography.

Here we may return to the idea of the map and mapping, noting that in mathematics a mapping is a correspondence (one-to-one, but also many-to-many) (Pickles 2004), in which one thing can be translated to another and vice versa. Ultimately, it is the network structure of digital communication, as opposed to previous one-way forms of communication (as in printed media such as books and traditional maps), which may facilitate a shift toward this sense of mapping as a dialogue—a search for correspondences. Deleuze and Guattari (1987) discuss the idea of networked or rhizomatic forms of organization, which are de-centered, multiply interconnected, and non-hierarchical. They contrast this with tree-like or arborescent structures, in which there is clear centralization and hierarchy. They illustrate these concepts by contrasting the map and the tracing. For Deleuze and Guattari, a tracing corresponds more closely to what we would more commonly think of as maps, the totalizing yet hollow reflections and representations of reality that de Certeau sees as devoid of possibilities and ultimately a meaningless attempt to document real experience. A tracing attempts to make an infinitely reproducible copy, something only possible by ignoring the inherent contingency of real life. Mappings, by contrast, emphasize the process of finding and constructing connections. "What distinguishes the map from the tracing is that it is entirely oriented toward an experimentation in contact with the real," Deleuze and Guattari write (1987: 12), emphasizing how the map can be both rooted in reality and open to possibility, while the tracing is neither.

On the surface, this formula of maps versus tracings shares some similarities with de Certeau's analysis of strategies versus tactics. Tracings, like strategies, can be separated from their environment and reproduced endlessly, fitting a system of knowledge onto the world rather than remaining situated in it. Mappings, on the other hand, while similarly rooted in contingent reality like tactics, can be productive: a mapping creates connections and fosters relationships, always growing and building upon itself. Mappings are flexible, but not ephemeral. "The map is open and connectable in all of its dimensions; it is detachable, reversible, susceptible to constant modification. It can be torn, reversed, adapted to any kind of mounting, reworked by an individual, group, or social formation. It can be drawn on a wall, conceived of as a work of art, constructed as a political action or as a meditation" (Deleuze and Guattari 1987: 12).

With a slight change in wording, we find this division between maps and tracings appearing in other sources. Denis Wood makes the distinction between "mapping" and "mapmaking" (1992, 1993). In this case, Wood's "map" aligns more with Deleuze and Guattari's "tracing", although for Wood, mapping appears to be a process that is purely mental, that does not produce any intermediate objects or representations, such as a mashup, whether or not they claim to be fixed, authoritative representations of reality. Comparing the example of a temporary map "drawn" with nothing but hand-gestures on a table and a pencil-drawn sketch map, Wood argues that the difference is "a thin line (it's the thickness of the lead in [a] pencil), but it is the difference between mapping and mapmaking. In the latter the map is always ... inscribed. It cannot be shaken off, it adheres, it sticks to the surface. No matter where you take it, it holds fast, it clings. No matter how long you wait for it to fall off, it hangs on, day after day, year after year..." (1993: 50).

While a web map mashup, with its visual representation of space, culturally agreed-upon signs, and aura of authority, is probably more like Wood's idea of mapmaking than mapping, it shares some resemblances with the idea of mapping. The Google (or Yahoo, or Microsoft) basemap is not drawn on-the-fly, but is stored as pre-rendered tiles in massive filesystems (and, as soon as you view them, duplicated in your browser's cache on your own hard drive). However, the layout of a mashup's pushpins is created on demand using JavaScript code in your own browser. The final map mashup itself is not stored anywhere. The code behind the mashup can be easily edited or rewritten, while the source data for those pins, if based on a live RSS feed, may also be changing from day to day or moment to moment. The effect, to over-stretch Wood's example, is a pencil-drawn sketch map where the marks "fall off" as soon as you stop looking at it.

Janet Abrams and Peter Hall make a similar distinction between the "map" and "mapping" in their recent text *Else/Where*: "If a map is a completed document, mapping refers to a process—ongoing, incomplete and of indeterminate, mutable form. [...] Where maps measure and notate the world, mapping is […] a 'collective enabling enterprise,' a creative act that describes and constructs the space we live in, a project that 'reveals and realizes hidden potential'" (2006: 12). Abrams and Hall are here building on quotes from James Corner, who writes "Mapping is a fantastic cultural project, creating and building the world as much as measuring and describing it. [...] Mapping precipitates its most productive effects through a *finding* that is also a

founding; its agency lies in neither reproduction nor imposition but rather in uncovering realities previously unseen or imagined. [...] Thus, mapping unfolds potential" (Corner 1999: 213).

So, on the one hand the term "mapping"—which Harley and de Certeau associated with a long history of colonialism and other projects of surveying, cataloging, and systematizing knowledge, all with a goal of producing a supposedly complete map as an end product—could be interpreted as an act that closes down meaning. But, as in Abrams and Hall's construction, by way of Corner and Deleuze and Guattari, we can also think of it as an open-ended project of experimentation, shifting attention away from the end product of the map and onto the process of mapping.

When considered not as tools for mapping, but as software artifacts, mashups also embody an open-ended, experimental approach. Goodman and Moed (2006) argue that unlike most software development approaches—including both conventional linear structure and iterative, yet still goal-oriented approaches—mashups are generally created without any final specifications and develop in a reactive, asynchronous manner in response to comments, changes in source data streams, and the evolution of other similar mashups. In this way, mashups exist in a permanent "beta" stage—always a prototype. These temporary mappings are more adaptable, flexible, more easily personalized. Geovisualization researcher Jason Dykes recognizes mashups as tools for user-driven data exploration, reworking the term "Egocentric Visualization" into what could be a new "EgoCarto" (Dykes 2008).

Mashups, despite their flexibility, can still only embody this practice of "mapping" in incomplete, flawed way. While Wood's conception of "mapping" is described in such a way that it is an actually-existing day-to-day practice in people's lives, the idea of "mapping" for Corner and of "maps" for Deleuze and Guattari could perhaps be thought of only as a theoretical abstract, a near utopian horizon towards which a more flexible and contingent mode of dealing with geography might aspire. In this sense, concepts of the map and the mapping exist as two ends on a continuum, where any real-world geographical practice will always exhibit some combination of the two.

On the one hand it is possible to interpret these various theories (Deleuze and Guattari's maps versus tracings, Wood's mapping and map making, Corner's maps and mapping) as different approaches to thinking about the same concept, seen from differing perspectives, at different times and for different purposes. But we could also interpret these frameworks as points on a

trajectory, where the theorized position of the "map"—a conventional, printed-paper reference map, for example—is gradually rehabilitated. That is, the map becomes viewed more and more as a process of mapping as theorists find new appreciation for the ways that map users work with and understand the printed map. Kitchin and Dodge (2007) could be seen as bringing this theoretical arc to its conclusion, granting to physical maps and authoritative cartography all of the flexibility and contingency that previous writers only granted to the non-physical, ideal of mappings. "[M]aps are never fully formed and their work is never complete," they write. "Maps are of-the-moment, beckoned into being through practices; they are always mapping. From this perspective maps are fleeting, contingent, relational and context-dependent, emerging through transductive processes to solve relational problems. This theoretical turn has led us to suggest that cartography is processual, not representational, in nature" (2007: 331).

Thus, after so many theoretical attacks on the printed map, after so many calls for new ways of mapping and thinking, after the arrival of the internet and networked mapping practices that have begun to challenge conventional cartography in fundamental ways, after all this, we now find that that conventional maps can be interpreted exactly as the kind of new mapping the critics had been calling for. Faced with such a conclusion, we should not be discouraged—by taking it to mean that different or better kinds of mapping are not needed—nor dismissive. Fundamentally, Kitchin and Dodge remind us that how a map is used is more important than what it represents, or how. The same is true for mashups. Is the internet, the preeminent network structure today, an embodiment of the process of mapping, and therefore are digital maps and mashups inherently rhizomatic? Do mashups inherently produce open mappings? Essentially, no: information and communications technologies do not create or perform mappings on their own, nor are they magical new tools that produce a democratic, rhizomatic structure in anything they touch, and nor are they inherently systems of control (whether hierarchical or rhizomatic themselves). Rather, these technologies are simply conduits for relations between people, part of the new hybrid digital/real landscape that presents opportunities but not predeterminations. In this new paradigm, as in the old, the process of mapping remains a social task, not a technical one.

Chapter 6: Conclusion

Mapping is a means for people to make sense of their world through active engagement in describing its spatial relationships. Thinking of mashups and neogeography in this way might help us assess how they relate to the professionalized discipline of GIS, and give us a framework by which we might assess mashups according to a different standard. We should, perhaps, never expect neogeography and mashups to present a finished, internally-consistent, "allegedly competent" map (Deleuze and Guattari 1987: 12). This also, however, raises the question of intent. To what extent do mashup creators (and wiki co-writers and co-editors) intend to create an open-ended project? Or do they see themselves in pursuit of a perfect representation of reality and truth, just through different means than traditional, expert-driven means?

Moving forward, this question of intent will be an important avenue of research, exploring further how and why people use mashups and mapping in their lives and what expectations they have of (neo)geography. Here is where academic geographers have a particular need to engage with neogeographers and treat them as more than observers. In addition to collaborating with the public on research through the use of Volunteered Geographic Information and by sharing data and results online, geographers must also help the public become more aware of the limitations of any geospatial technology, and to help them be more critical consumers—and, increasingly, producers—of the digital information that surrounds us.

Just as the public must adapt in order to become more active participants in a more democratic internet, the underlying information and communications technologies also has to evolve if the internet is to be available equally to everyone. The digital divide remains a persistent problem, although there are positive signs of developing countries and disadvantaged communities leapfrogging directly to latest technology. An example of this is the roll out of cellular networks and wireless networking in Africa, skipping the costly installation of wired infrastructure. From the perspective of the Geoweb, crowdsourcing and similar practices may provide a way for these areas to create digital basemaps more easily and cheaply, bypassing or at least delaying the need for expensive professional surveying. However, any progress in these areas must also be tempered by questions of who owns and controls these alternative infrastructures.

We must also ask whether the global growth in instantly accessible and mashable data is environmentally sustainable. The demand for electricity has lead Google to locate its server

farms near sources of cheap power, as in the recent case of its new data center in The Dalles, Oregon, sited adjacent to hydroelectric plants on the Columbia River (Carr 2008: 66). These ever-expanding power needs may not be not supportable economically or ethically. In a shift toward reduced energy consumption, we may have to give up the idea of being able to search for all information everywhere through brute-force indexing like that employed by Google. In pursuit of more intelligent web searching, academics are directing extensive research toward developing the Semantic Web (sometimes called Web 3.0) (Shannon 2006), enabling computers to understand the ontological structure of information. The Semantic Web could help search engines retrieve information much more efficiently. Conversely, it might also prove to be even more energy-intensive, demanding ever more computation and artificial intelligence. If the current state of the web is any indication, the development of a formal, heavy-weight Semantic Web will be paralleled by a crowd-sourced, folksonomic alternative, relying on augmentation of human social networks, rather than computer simulation of human intelligence. Instead of searching the entire web through the massive database of one search engine, users might track down geospatial information through friend-of-a-friend networks or local experts, relying on shared webs of trust for validation and filtering. Instead of one all-encompassing Geoweb, we might see myriad smaller, local Geowebs, all loosely connected.

As the web continues to evolve, we may find that the current moment is just a brief window in which mashups are distinguishable from other forms of mapping, or distinguishable from the digital landscape itself. If the majority of data is eventually tagged with geographic coordinates, the act of mapping the contents of a database may become so commonplace that it seems as unremarkable as sorting a list alphabetically or plotting a bar chart from numerical values in a spreadsheet. Similarly, if the Web 2.0 promise of seamless interoperability and free exchange of data becomes a reality, mashing two datasources together may be equally unremarkable. In this sense, as mashups themselves tend toward the momentary and the fleeting, so too the genre of mashups as an object of study may also be little more than a temporary assemblage of technologies and practices that will also be revised, reworked, and remixed into the next wave of technological changes.

Finally, whether or not the mashup disappears as a concept or a subject of study, there remains the question of the permanence of individual mashups. Google's energy consumption is driven by the need to index all *current* web pages; the task of maintaining archives of previous

versions or cached copies of defunct web sites is beyond even Google's interests and, perhaps, capabilities. Studies that have attempted to quantify the half-life of web pages have found that most pages disappear after only a few years (Koehler 2004). Mashups are not likely to fare better. User-created data may persist indefinitely when it is uploaded to centralized servers (like Google's) and has left the control of the user, joining the individual's "data shadow" (Zook 2004). But mashups that are hosted on a user's web site, that are ad hoc, that use whichever version of a mapping API is available at the time of writing will break down easily, to say nothing of the fact that mashups composed of nothing but the relationships between two or more external data sources will never produce the same map twice. If mashups are a necessary tool to represent the contingency, mutability and multiplicity of lived spatial experience, is it inevitable that mashups themselves must be fleeting and impermanent?

When a mashup disappears, what is lost? If the dream of a democratic mapping is, in some ways, coming true, will the masses be disempowered again as their cartographic voices continually crumble and disappear? How can mashups talk about the past, and how can people talk about mashups of the past? Since mashups have a weakness when it comes to representing time, how might this technical inability to access the past also work socially, combined with a hyper-accelerated pace of activity on the internet that produces a kind of amnesia though a constant overwriting of history? Some mashups will change to adapt to new technologies and new social roles, others will be taken down, while those that remain unchanged will eventually, inevitably, stop working as the Web evolves around them. As servers upgrade their software, the mashup code itself may no longer execute (assuming it is lucky enough to be archived somewhere), and the constituent data sources may be long gone. When the era of mashups is over, replaced by whatever comes next, will anything remain but scattered screenshots and textual descriptions? How then will a history of mashups be written? Will there be a Brian Harley of mashups?

In truth, the histories of mashups, including this one, will be written as any other history, gathered from fragments and impressions, from incomplete, situated knowledge. Mashups may seem fleeting and vaporous when contrasted with the tactile reality of printed maps, or the vast digital vaults storing our data shadows. But these more "permanent" and "complete" databases and maps are also missing something: the unique, real-world events and experiences that generated those database records, or those marks on a map. The more a permanent, panoptic database

attempts to capture all the digital representations of a place or an individual, might it become more susceptible to crashing, data corruption and hacking? As mashups try to be responsive to the user and attempt a more unmediated, situated integration with reality, do they sacrifice context and connectivity online, becoming isolated islands of information?

The dichotomies between permanent and temporary, connected and disconnected, original and copy, expert and amateur, are increasingly difficult to maintain. This is a problem and a strength of the web itself, and as in many ways, mashups tell its story. Mashups trace and embody the changes still unfolding on the Web and in networked society at large, changes whose implications are far from determined. Thus, the history of mashups is a partial story, an incomplete, unfinished map. As in any history or any map, something is always lost.

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